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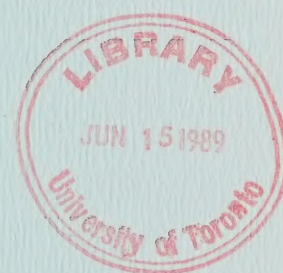
Ontario

ENVIRONMENTAL ASSESSMENT BOARD

VOLUME: 109

DATE: June 6th, 1989

BEFORE: M.I. JEFFERY, Q.C., Chairman
E. MARTEL, Member
A. KOVEN, Member



FOR HEARING UPDATES CALL (TOLL-FREE): 1-800-387-8810

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HEARING ON THE PROPOSAL BY THE MINISTRY OF NATURAL
RESOURCES FOR A CLASS ENVIRONMENTAL ASSESSMENT FOR
TIMBER MANAGEMENT ON CROWN LANDS IN ONTARIO

IN THE MATTER of the Environmental
Assessment Act, R.S.O. 1980, c.140;

- and -

IN THE MATTER of the Class Environmental
Assessment for Timber Management on Crown
Lands in Ontario;

- and -


IN THE MATTER of an Order-in-Council
(O.C. 2449/87) authorizing the
Environmental Assessment Board to
administer a funding program, in
connection with the environmental
assessment hearing with respect to the
Timber Management Class
Environmental Assessment, and to
distribute funds to qualified
participants.

Hearing held at the Ramada Prince Arthur
Hotel, 17 North Cumberland St., Thunder
Bay, Ontario, on Tuesday, June 6th,
1989, commencing at 11:15 a.m.

VOLUME 109

BEFORE:

MR. MICHAEL I. JEFFERY, Q.C.	Chairman
MR. ELIE MARTEL	Member
MRS. ANNE KOVEN	Member



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(iii)

APPEARANCES: (Cont'd)

MR. C. BRUNETTA

NORTHWESTERN ONTARIO
TOURISM ASSOCIATION

I N D E X O F P R O C E E D I N G S

<u>Witness:</u>	<u>Page No.</u>
<u>J. JOSEPH CHURCHER,</u> <u>EDWARD ISKRA,</u> <u>ROBERT L. GALLOWAY,</u> <u>ROBERT A. CAMPBELL,</u> <u>MICHAEL EDWIN BUSS,</u> <u>PETER PHILLIP HYNARD,</u> <u>CINDY STERN KRISHKA, Resumed</u>	18119
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I N D E X O F E X H I B I T S

<u>Exhibit No.</u>	<u>Description</u>	<u>Page No.</u>
617	Photographs contained in Panel 12 witness statement at page 194.	18117
618	Forests for Tomorrow Interrogatory Nos. 5 and 6 (Panel 12) and Nishnawbe-Aski Nation Interrogatory Nos. 6 nd 7 (Panel 12).	18118
619	Hard copies of slides referred to by Dr. Campbell in his evidence-in-chief.	18118
620	Copies of overheads to be used by Mr. Galloway in evidence-in-chief (A to O).	18142
621	Document entitled: Summary of Documented Complaints Received by MNR Districts with respect to Pesticide Use in Forest Management, 1984-1988 prepared by Messrs. Galloway and Buss dated May 31st, 1989.	18143
622	Document entitled: Number of Reported Injuries and Days of Lost Time for MNR Chemical and Manual Tending Operations in the Area of the Undertaking for the period 1980-1988 dated May 31st, 1989.	18143
623	Series of overheads (A to G) to be used in Ms. Krishka's evidence-in-chief.	18214
624	Hard copies of photographs to be used by Ms. Krishka in Evidence-in-chief.	18215

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<u>Exhibit No.</u>	<u>Description</u>	<u>Page No.</u>
625	List of slides to be used by Ms. Krishka in evidence-in-chief.	18215
626	MOE Interrogatory Question No. 12 (Panel 12).	18215
627	FFT Interrogatory Question No. 11 (Panel 12).	18215
628	Study entitled: Spruce Height and Volume Growth, Response to an Aerial Release Treatment Using 2,4-D on Three Plantations Near Manitouwadge, Ontario by Krishka and Towill dated 1989.	18216
629	Study entitled: Jack Pine Height and Volume Growth, Response to an Aerial Release Treatment Using 2,4-D on a Plantation Near Atikokan, Ontario by Krishka and Towill dated 1989.	18216

1 ---Upon commencing at 11:40 a.m.

2 THE CHAIRMAN: Thank you. Be seated,
3 please.

4 Ladies and gentlemen, for the remainder
5 of this week Ms. Sonstenes from the Environmental
6 Assessment Board office in Toronto will be looking
7 after the EAB reading room and office. Mr. Mander is
8 required in Toronto for the remainder of the week.

9 For those parties who will be examining
10 witnesses for the next couple of days, if you would
11 kindly give her the list of exhibits that will be
12 required for the following day she will take care of
13 that, as well as perform the normal functions that Mr.
14 Mander performs in connection with this hearing.

15 Thank you.

16 MR. FREIDIN: Mr. Chairman, are we
17 planning to break at one o'clock for lunch?

18 THE CHAIRMAN: Well, I think -- I take it
19 nobody here has eaten, as far as lunch is concerned,
20 and I think that would probably be what we should do.
21 Perhaps break for an hour between one and two, if that
22 would be acceptable.

23 MR. FREIDIN: Sure.

24 THE CHAIRMAN: And then come back at two
25 and go to five or 5:30 or some time in the afternoon.

1 MR. FREIDIN: I may finish with Dr.
2 Campbell just before one, so we will play it by ear. I
3 was just wondering whether we were going to get lunch,
4 that's all.

5 THE CHAIRMAN: Yes, yes.

6 MR. FREIDIN: You know how eager we are
7 to move here.

8 Mr. Chairman, if I might, I would like to
9 file the hard copies of Exhibit 616A through D. Those
10 are the four new photographs that Mr. Hynard filed.

11 THE CHAIRMAN: Very well.

12 MR. FREIDIN: (handed)

13 MRS. KOVEN: Thank you.

14 MR. FREIDIN: And perhaps we could mark
15 as the next exhibit some documents which will be
16 referred to by Dr. Campbell.

17 The first will be copies of the
18 photographs which are in his paper in the witness
19 statement which begins on page 194 of the witness
20 statement.

21 THE CHAIRMAN: Very well. Exhibit 617.

22 ---EXHIBIT NO. 617: Photographs contained in Panel 12
23 witness statement at page 194.

24 THE CHAIRMAN: Are there any additional
25 photographs to what is in the witness statement?

1 MR. FREIDIN: There are not.

2 THE CHAIRMAN: Thank you.

3 MR. FREIDIN: I will bring those up in a
4 moment, Mr. Chairman.

5 I would also like to file a number of
6 interrogatories which relate to Dr. Campbell's subject
7 matter. They are interrogatories from Forests for
8 Tomorrow, No. 5, No. 6, and those are both from Panel
9 12. As well from Panel 12, Nishnawbe-Aski Nation
10 Interrogatory No. 6, 7. That's it.

11 THE CHAIRMAN: Exhibit 618.

12 MR. FREIDIN: (handed)

13 THE CHAIRMAN: Thank you.

14 ---EXHIBIT NO. 618: Forests for Tomorrow
15 Interrogatory Nos. 5 and 6
16 (Panel 12) and Nishnawbe-Aski
Nation Interrogatory Nos. 6 and 7
(Panel 12).

17 MR. FREIDIN: And I would like to hand
18 out hard copies of the slides that Dr. Campbell will
19 use during his presentation.

20 THE CHAIRMAN: That will be Exhibit 619.

21 ---EXHIBIT NO. 619: Hard copies of slides referred to
22 by Dr. Campbell in his
evidence-in-chief.

23 MR. FREIDIN: Two corrections to the --
24 one addition and one correction to the witness
25 statement on page 237. The fourth number 73,346 should

1 read 73,338.

2 MS. CRONK: Can I have that again,
3 please?

4 MR. FREIDIN: 73,338. And on page 235 in
5 the fourth last line you will notice that there is a
6 reference to a footnote No. 4 beside the word map.
7 There is no footnote. If I might just read to you what
8 that footnote should be. It should read:

9 "When the same statistics were calculated
10 for the whole province the average area
11 treated in a base map or township was 231
12 hectares."

13 MS. CRONK: How much?

14 MR. FREIDIN: "231 hectares (1.0 per
15 cent of the base map or township area)."

16 Dr. Campbell, are you going to need the
17 lights dimmed?

18 DR. CAMPBELL: Yes.

19 J. JOSEPH CHURCHER,
20 EDWARD ISKRA,
21 ROBERT L. GALLOWAY,
22 ROBERT A. CAMPBELL,
23 MICHAEL EDWIN BUSS,
24 PETER PHILLIP HYNARD,
25 CINDY STERN KRISHKA, Resumed

23 CONTINUED DIRECT EXAMINATION BY MR. FREIDIN:

24 Q. Dr. Campbell, could you advise the
25 Board of the subject matters or the topics that you

1 will be covering today?

2 DR. CAMPBELL: A. Yes. My presentation
3 today is going to be divided into three different
4 parts. The first part is going to be forestry
5 herbicide concepts, just a little bit about herbicides
6 per se and how they are used.

7 The second part, we are going to deal
8 with application equipment, and the third part is
9 simply some statistics on the use of herbicides in
10 forestry in Ontario and how those -- that use pattern
11 relates to other herbicide uses.

12 I am going to be talking about the first
13 two topics now. The third topic on the forestry
14 herbicide use and use in perspective I will be
15 presenting after Mr. Galloway has made his presentation
16 because I think it is a little more meaningful at that
17 time.

18 We start off on the section of the
19 forestry herbicide concepts. I will start off with the
20 basics. Why do we use a herbicide. The purpose of
21 using a herbicide.

22 There is really three reasons why we
23 might use herbicides, and the first is to temporarily
24 suppress vegetation which is currently adversely
25 affecting crop trees or which is likely in the near

1 future to adversely affect crop trees.

2 The second reason for using herbicides is
3 to thin crop trees which are -- have become too dense.
4 Mr. Hynard referred to this yesterday. And the third
5 purpose of using herbicides would be to dry out
6 vegetation in order to facilitate a prescribed burn.

7 Now, if you are going to use a herbicide
8 to assist in forest management, obviously the herbicide
9 has to be selective. In other words, there has to be
10 some way that you can use the herbicide such that it
11 will suppress the vegetation which is competing without
12 adversely affecting your crop.

13 And there is three different ways in
14 which you can attain this selectively. The first is
15 through timing, and by this what we mean is it is
16 possible to treat the target vegetation before the crop
17 trees are planted, and this is what we are referring to
18 as chemical site preparation.

19 The second way of attaining selectivity
20 is to use a directed application; in other words, you
21 apply the herbicide to the vegetation which you want to
22 control but do not apply it to your crop trees.

23 The third type of way in which you can
24 get selectivity is by relying on differences in
25 tolerance. For some combinations of a crop and a

1 vegetation which you wish to control there is a
2 herbicide which will affect the target species but not
3 affect your crop.

4 Q. So if we are doing a directed
5 application, are those then ground applications?

6 A. Yes. If you are using a directed
7 application, obviously this is something which by and
8 large can only be done manually, it is not something
9 that could be done in a broadcast fashion or using, for
10 example, an aircraft.

11 We are using five different herbicides
12 operationally within the area of the undertaking, and I
13 don't propose to describe these herbicides in detail
14 because they are described at some length on pages 204
15 to 217 in the statement of evidence.

16 There is a summary of the characteristics
17 of the different herbicides in Table 2, page 12 of
18 Document No. 4, The Environmental Effects of Pesticide
19 Use for Forest Management in Timber Management in
20 Ontario.

21 MR. FREIDIN: That's Exhibit 604C, Mr.
22 Chairman. Page 12 of that document.

23 DR. CAMPBELL: However, I would like to
24 spend a few minutes describing some of the differences
25 between the herbicides and I think then this will give

1 you a slightly better understanding of the different
2 ways in which they may be used.

3 We start off -- the first way in which
4 they differ might be the mode of uptake. The
5 herbicides 2,4-D and glyphosate are both taken up
6 through the leaves. On the other hand, the herbicides
7 hexazinone and simazine enter the plant by the roots.
8 The herbicide picloram, at least in the way in which we
9 use it, enters the plant through the stem.

10 MR. FREIDIN: Q. I understand that later
11 we will see that the first two herbicides that you
12 mentioned, glyphosate and 2,4-D, are the two which make
13 up the bulk of herbicides use in Ontario?

14 DR. CAMPBELL: A. That is correct.
15 The second way in which --

16 Q. In forestry, I am sorry.

17 A. Sorry?

18 Q. I should be specific, in forestry.

19 A. In forestry, yes. The second way in
20 which the herbicides differ is in terms of the species
21 which they control. The two herbicides which are taken
22 up by the leaves, 2,4-D and glyphosate, will control
23 species such as pin cherry, alder and birch.
24 Glyphosate, in addition to those species, will also
25 control species such as grass, raspberry and aspen, and

1 these latter three species are ones which are very
2 serious competitors on the more fertile sites.

3 The herbicide simazine, which as I
4 pointed out was taken up through the roots, will only
5 control herbaceous or non-woody species. Hexazinone
6 will control either woody species or herbaceous species
7 depending upon the way on which it is applied.

8 The third way in which these herbicides
9 differ is in terms of the developmental stages which
10 are controlled. For example, herbicides which are
11 taken up through the leaves can obviously only control
12 vegetation which is present and has leaves on it at the
13 time of the application. Any vegetation which sprouts
14 from roots or germinates from seed following the
15 application will not be controlled.

16 Simazine, which is taken up through the
17 roots, will control plants which germinate from seed
18 after the application, but it won't control plants
19 which are established, whether they are woody or
20 whether they are annual herbaceous plants or perennial
21 herbaceous plants. If they are established and have a
22 root system going simazine usually will not control
23 them.

24 Q. Is there any particular reason, Dr.
25 Campbell, that you need as many as five different

1 herbicides?

2 A. Yes. This is a question which is --
3 has been raised before: Why do you need so many
4 different herbicides, and I think one of the best ways
5 to explain that is to use an analogy to building a
6 house. It is entirely possible for a person to start
7 with simply a hatchet and standing timber and to build
8 a house, but it is going to be a fairly crude house.

9 If you give him some other tools, a saw,
10 a plane, tape measure, a level, then obviously he can
11 do a much finer job. By the same token, with the
12 herbicides, if we have a number of different herbicides
13 which behave in different ways, we are able to manage
14 vegetation with a greater degree of finesse.

15 Herbicides may be used to control
16 vegetation either before planting a crop or after
17 planting a crop. In the first instance we would refer
18 to it as chemical site preparation; in the second
19 instance we would refer to it as chemical tending.

20 Now, in Panel 11 chemical site
21 preparation was touched on briefly. Mr. Kennedy had a
22 graph in his report which showed the relative
23 proportions of the different types of site preparation
24 over several years. He also showed a video which
25 included a ground sprayer doing chemical site

1 preparation.

2 Q. How do you choose between chemical
3 site preparation and chemical tending to control
4 vegetation?

5 A. Well, there are basically three
6 situations in which chemical -- four, I should say,
7 four situations where chemical site preparation would
8 be preferred over chemical release.

9 The first is when there is enough
10 vegetation on the site prior to planting the crop trees
11 which is dense enough and tall enough that it would
12 immediately compete with the crop trees after they were
13 planted.

14 The second situation where you might
15 choose chemical site preparation would be where the
16 vegetation on the site at the time of the planting is
17 not particularly dense or tall, but you know that it is
18 going to be very competitive before you could apply a
19 release treatment.

20 These next two photos come from page 242
21 in the statement of evidence. They are photos 1 and 2.
22 There is this photo and there is a couple of points
23 that will be made from this. This photo was taken at a
24 site near Manitouwadge in September of 1979.

25 In the spring when trees were planted on

1 this site there was very little grass. And if we take
2 a close-up we can see down here the very small crop
3 tree which is obviously a long way down in the grass.
4 And this is a very good example of how fast vegetation
5 will occupy a forest site after harvesting,
6 particularly fertile sites.

7 Now, in this particular instance, this
8 was 1979, there was not a herbicide which would control
9 this grass. And what will happen here -- I didn't go
10 back to this particular site the next spring, but I
11 know what I would have seen. During the winter the
12 snow will come, it will pack down the grass and that
13 grass will simply bury that crop tree.

14 In Panel 4 Mr. Gordon referred to the
15 increased survival of spruce in recent years because of
16 a new herbicide which could control the competition
17 which appeared on mixed wood sites. This is the type
18 of competition that he is talking about and the
19 herbicide which he was referring to is the herbicide
20 glyphosate. He used the trade name for it which was
21 roundup.

22 Now, if we get back to the concept of
23 chemical site preparation versus tending, in this
24 particular case if we are going to use the herbicide
25 glyphosate we are going to rely on the difference in

1 tolerance between the crop trees and the grass.
2 However, the crop trees are only tolerant when they are
3 dormant; in other words, the latter part of the growing
4 season, usually late August through early September.
5 Of course they would be dormant during the winter but
6 the grass would not be susceptible at that time.

7 So the difficulty that the forester would
8 run into here, even if he had glyphosate, by the time
9 that grass was up -- or by the time the crop trees had
10 become dormant in 1979, the grass would have been very
11 nearly as tall as it was there. It simply wouldn't
12 have the seed heads on it. So if the glyphosate were
13 used, it would control the grass but that grass would
14 still fall down and flatten the trees during the
15 winter.

16 So in this particular case glyphosate or
17 a release treatment basically would be too late, and
18 the preferred treatment here would be some sort of
19 treatment which -- a chemical site preparation. In
20 this particular case, what they would have had to do
21 was wait for a year, allow that grass to come up, treat
22 it and then plant subsequent to that.

23 Q. Dr. Campbell, you have used the word
24 release in your evidence and you have also used the
25 word cleaning. Are those the same?

1 A. Yes, they are.

2 Q. All right.

3 A. A third reason for choosing chemical
4 site preparation versus chemical release or tending
5 would be a situation in which there is no herbicide or
6 method of applying it such that the competing
7 vegetation can be controlled without damaging the crop
8 trees which are present.

9 A fourth reason for applying chemical
10 site preparation would be the fact that, as I
11 mentioned, the time frame in which the conifers or crop
12 trees are tolerant to the herbicide is relatively
13 short.

14 And then, as will be discussed by Mr.
15 Galloway and also Mr. Nicholson and Mr. Iskra, there
16 are a number of constraints in terms of the number of
17 days that you may have available due to weather to do
18 spraying, that's if you are going to use the herbicide
19 for a tending or release treatment.

20 If you use the herbicide for chemical
21 site preparation you have a wider time frame, you can
22 in fact make the application earlier in the season. So
23 if one is in a position of having a large program,
24 trying to get it done, large program of controlling
25 competing vegetation, there may be some advantages to

1 try to -- if you have an option of one or the other,
2 try to choose the site preparation rather than tending.

3 There is another reason why chemical site
4 preparation is used - although it is not a case of
5 choosing between that and tending - and; that is again,
6 drying up the vegetation to facilitate a prescribed
7 burn.

8 Q. Is it necessary in some cases to
9 treat an area with chemical herbicide both as a site
10 preparation treatment and also as a tending treatment?

11 A. Yes, it is, sometimes.

12 Q. And could you indicate when that
13 would be the case or why that would be the case?

14 A. Well, there is a couple of reasons.
15 One is that it may actually be done by design, the
16 other is that the chemical site preparation was not
17 effective enough.

18 One of the things that you have to
19 realize is that the control or suppression of competing
20 vegetation by herbicides, the herbicides that we use,
21 is relatively short lived. None of the herbicides that
22 we use will control vegetation for more than a couple
23 of years and it is not unusual on a fertile site for
24 vegetation, which was controlled prior to planting, to
25 regrow and become a serious competitor before the --

1 again before the crop trees are free to grow.

2 As an example of a planned treatment
3 where we used both chemical site preparation and
4 release, I would suggest something as the following:
5 The site was harvested this past winter. I would like
6 to be able to plant it this spring. It is a fertile
7 site and I know that I am going to have grass up to my
8 armpits by August. I also know that the birch that was
9 planted was going to sprout, but it's not going to be a
10 serious competitor for two or three years.

11 So what I would probably choose to do
12 would be to apply hexazinone as a site preparation.
13 This would control the grass and other herbaceous
14 vegetation in the first year or two which is coming up
15 from seed and then a couple of years down the road when
16 the birch became competitive, I might use a herbicide
17 such as 2,4-D or glyphosate to control the birch.

18 Now, if there aren't any specific
19 questions on that area, I would like to move on to the
20 application equipment part.

21 THE CHAIRMAN: Dr. Campbell, when
22 treating a particular site, is it often the case where
23 you will use more than one chemical on the same site,
24 or would you go back in, say, a situation where you
25 have had site preparation using one chemical and then

1 chemical tending at some time in the future, would you
2 be using the same chemical?

3 DR. CAMPBELL: This varies. It depends
4 upon what you are using. If we went back, perhaps
5 historically the situation where before we had
6 glyphosate which will control, for example, trembling
7 aspen fairly well, 2,4-D if it is used on aspen what it
8 will tend to do is simply top kill and you get very
9 fast resprouting from the roots.

10 As Mr. Hynard pointed out, you can start
11 off with two metre high aspen and in a year or two you
12 are going to have two metre high aspen again. In those
13 days that type of situation they probably would have
14 used -- well, they wouldn't have had a choice. They
15 would have had to use 2,4-D repeatedly.

16 Say in the particular situation I was
17 talking about here, we had the initial situation where
18 you want to control vegetation which is coming up from
19 seed, you don't have the option of using -- of
20 herbicide which is absorbed through the foliage, you
21 have to use one that is going to be absorbed through
22 the roots. So this is why I choose the hexaz -- or
23 the -- yes, the hexazinone.

24 On the other hand, as I point out, the
25 hexazinone at least on a broadcast type of treatment

1 will not control the woody vegetation. So we would use
2 a different herbicide at that time.

3 THE CHAIRMAN: I guess what the Board's
4 concern would be - and this may not be the place to get
5 into it - but has there been some attention paid to
6 what maybe synergistic effects of using more than one
7 chemical together, if there is going to be any impact
8 from those chemicals?

9 DR. CAMPBELL: We are not -- with the
10 exception of some of the southern Ontario situation
11 which is an old -- what will call planting on old
12 agricultural land, herbicides are not mixed together,
13 and they are not -- as far as I can recall. I don't
14 think -- well, we certainly don't mix them together and
15 apply them at exactly the same time.

16 Conceivably one herbicide could be
17 applied and then immediately after another one would,
18 but that is not a situation which we have been doing at
19 the present time. Although it is -- I think, as you
20 are aware, it is a very common situation in agriculture
21 to have mixtures.

22 In fact, if you just take something that
23 is common as the -- one of the common lawn herbicides
24 Killex in fact consists of three different herbicides
25 which you mix together.

1 The next section is -- deals with
2 application equipment. There are a number of different
3 pieces of equipment and the choice depends on a number
4 of factors: Size of the area, target species, the
5 particular herbicide, presence or absence of an
6 overstorey, accessibility and silvicultural objective.

7 I don't propose to elaborate on these
8 because they are discussed on pages 224 to 227 of the
9 statement of evidence and Mr. Galloway will also be
10 addressing them to a certain extent as well, but what I
11 would like to do is briefly discuss the different
12 pieces of equipment and I think you will see, as I
13 discuss them, how some of these factors fit in.

14 The first category of application
15 equipment would be cut surface applicators and the
16 principal here is to apply herbicide to a wound in the
17 stem of a woody plant from whence it travels to the
18 root and kills the plant. And the simplest method of
19 doing this, at least requiring the least equipment, is
20 to make an axe frill or score around the bark and then
21 wet this frill with herbicide.

22 Mr. Hynard yesterday referred to the
23 Jim-Gem or the applicator. This is generically
24 referred to as a basal applicator. It consists of a
25 hollow tube which is filled with herbicide. It has a

1 sharp point on it and it also has a leaver on the top.

2 The idea is you jab it into the tree then
3 tip it downwards to leave a little bit of a cup of bark
4 and then you pump the handle to pump a metered amount
5 of herbicide into the little cup that you have formed
6 on the bark. The important thing to note here is this
7 type of applicator is only good for large stems.
8 Obviously if you have a very small stem that is the
9 diameter of your finger, you cannot jab this into
10 and --

11 MR. FREIDIN: Q. And the Figure 1 that
12 you have up on the screen is found on page 219 of the
13 witness statement.

14 DR. CAMPBELL: A. That's correct.
15 Another method of applying herbicide is a combination
16 on a brush saw. In this particular piece of equipment
17 it's a standard brush saw with a motor, saw blade here
18 and what they have added to it, you have a container of
19 herbicide, you have a small pump here somewhere - up
20 here somewhere - there is a tube runs down here and
21 there is a nozzle which applies herbicide to the bottom
22 of the saw blade.

23 As the saw is used to cut stems, the
24 herbicide is applied then on to the cut surface of the
25 stump. The one thing to realize here that may not have

1 been completely clear when Mr. Hynard was talking
2 yesterday, he was showing using this type of equipment,
3 at least the brush saw for a thinning -- a jack pine
4 thinning and the thing to remember here is, if you cut
5 off a jack pine stem, it will not resprout; on the
6 other hand, if you cut off an aspen stem or a birch, or
7 a maple stem, it will tend to resprout and by adding
8 the herbicide at the same time as you cut it, then the
9 herbicide will kill the roots and is prevented from
10 resprouting.

11 Q. Dr. Campbell, when you say aspen will
12 resprout. Aspen and poplar, are those words used
13 interchangeably?

14 A. Basically, yes.

15 Q. Thank you.

16 A. Yesterday Mrs. Koven asked about the
17 colour of the -- apparent colour of the herbicide and
18 in fact I think Mr. Hynard mentioned that the herbicide
19 itself wasn't coloured, but a dye had been added and
20 there are a couple of reasons for doing this:

21 One is that the herbicide is, generally
22 speaking, fairly well colourless, it's not easy to see
23 it. In both these types of applicators, the actual
24 nozzle, whatever it is that disperses the herbicide,
25 tends to be very small because you are only dispensing

1 a very small amount of herbicide. It's relatively easy
2 for it to get plugged or for the tube to get airlocked
3 or even the chemical may run out before you are
4 finished and it's -- by adding the dye to the herbicide
5 it's possible to make sure that the herbicide -- you
6 can see that the herbicide is in fact going on.

7 The other purpose of putting the dye in
8 can be sort of for a type of, I guess you could say
9 almost, compliance monitoring, in the sense that you
10 can check that the herbicide is being applied,
11 supervise that the herbicide is being applied to the
12 right place, it's not being spilt somewhere else and
13 that the applicator is taking appropriate precautions
14 not get it on himself.

15 This dye is a very intense dye and is
16 very obvious if you even get a few tiny drops it will
17 show up.

18 The next type of applicator is referred
19 to as an exact delivery hand gun applicator. Sounds a
20 bit lethal, but also referred to as a spot gun.

21 This photo is actually photo No. 3 from
22 page 242 of the evidence. What it is, it's basically
23 just a sophisticated water pistol. You can actually
24 adjust the amount of material which is dispensed at a
25 single squirt. What it is used to do is to apply

1 concentrated spots of hexazinone. In this particular
2 case the product name is Velpar, place these
3 concentrated spots on the ground. Woody plants will be
4 controlled if the spots are placed close to the base of
5 the stem.

6 Obviously it's somewhat impractical. If
7 the stems that you want to control are extremely dense,
8 you have to put down too many spots and it becomes very
9 labour intensive. It is also ineffective if the
10 competing stems or the stems you want to control are
11 very close to your crop trees because if you put a spot
12 of the chemical very close to the crop tree you will
13 kill it as well.

14 Backpack sprayer. This is photo No. 4
15 from page 242 in the statement of evidence. The system
16 that you have here consists of a tank which is on the
17 worker's back, there is a pump, he has a pump handle
18 here which builds up pressure in the system, there is a
19 hose, there is a spray wand, there is a nozzle and he
20 has a trigger here. This type of application equipment
21 is used to spray the vegetation in the immediate
22 vicinity of the crop tree.

23 As you can see this allows a directed
24 application. It's possible to spray the vegetation
25 without spraying the crop tree. It's also, I think

1 would be, fairly obvious that this type of equipment
2 would not be very practical for spraying tall brush.
3 It is used mainly in southern Ontario where crop trees
4 are planted on former agricultural land, areas that are
5 too small to warrant bringing in, say, a tractor with a
6 sprayer on it or which may be -- the terrain may be too
7 rough.

8 Ground broadcast sprayers. This is the
9 type of sprayer which you saw in Mr. Kennedy's video.
10 The system again is not too different from what we had
11 in the case of the backpack sprayer. You have a tank,
12 you have a pump, in this case a gasoline engine pump
13 and you have hoses which run out to nozzles. The tank
14 is either towed by something such as a skidder or it
15 may actually be mounted directly on a skidder or
16 tractor.

17 Now, on agriculture land using this type
18 of sprayer normally would have a boom, just simply a
19 rod which holds a series of nozzles extending out on
20 either side of the machine and the total length of the
21 boom would probably be somewhere in the neighbourhood
22 of 5 to 10 metres, 15 to 30 feet.

23 Now, if you are on a cut-over situation,
24 as you see here, you tend to have standing vegetation,
25 you also have the situation that as the sprayer travels

1 over various obstructions it will tilt back and forth.
2 I think you can see that in that particular case a boom
3 would not be very practical because it would
4 undoubtedly get broken off.

5 So on the cut-over type situations we
6 would normally use what is referred to as a cluster
7 nozzle and what you simply have here is a manifold with
8 five different nozzles on it and they put out different
9 spray outputs so that you in fact have the top nozzle
10 treats the furthest area out, the next nozzle treats
11 the intermediate area, the bottom nozzle treats the
12 area directly underneath.

13 This will actually treat a wider swath in
14 the neighbourhood of 15 metres and because it is
15 located directly behind the machine and doesn't
16 protrude out, it will not be damaged.

17 I should point out that this photo is
18 from Figures 3 and 4 on page 223 of the evidence.

19 Aerial application equipment. This photo
20 is from -- it is photo No. 6 from page 244 of the
21 evidence. Mr. Nicholson and Mr. Iskra are going to
22 describe this information, this system in detail, but I
23 would just like to make a couple of points.

24 You have something that is essentially
25 the same as the ground sprayer, you have got a tank,

1 you have got a pump, you have got nozzles, and you have
2 got something to transport it. In the one case you are
3 using the skidder; another case you are using an
4 aircraft. The same amount of herbicide is applied but
5 because the aircraft flies faster it is able to cover
6 more ground in the time.

7 Just in passing here I might point out,
8 we have -- in fact this was an experimental application
9 and we added dye to the spray so that we could actually
10 see where it was going.

11 And so that is it for the basic run
12 through on the application equipment.

13 MR. FREIDIN: And as he indicated, the
14 part on the forestry use of herbicides will be dealt
15 with after Mr. Galloway's evidence.

16 THE CHAIRMAN: Thank you.

17 MR. FREIDIN: Mr. Chairman, I just wonder
18 whether you want to break now and we might be able to
19 get -- if we come back at 1:30, we can get the next two
20 witnesses, Mr. Galloway and Ms. Krishka in this
21 afternoon.

22 THE CHAIRMAN: All right. Why don't we
23 do that then.

24 We will adjourn until 12:30 -- sorry,
25 1:30.

1 ---Recess taken at 12:30 p.m.

2 ---On resuming at 1:40 p.m.

3 THE CHAIRMAN: Thank you. Be seated,
4 please.

5 MS. MURPHY: We are sorry to keep you in
6 the dark, but Mr. Galloway is going to be using a
7 number of overheads and I think it best to just leave
8 things the way they were.

9 THE CHAIRMAN: It won't be the first
10 time.

11 MS. MURPHY: I have a number of documents
12 to file. I thought it might be more convenient to file
13 all of the documents at the beginning, there are three,
14 rather than taking time as he went through to deal with
15 individual exhibits.

16 THE CHAIRMAN: Okay.

17 MS. MURPHY: The first one is a series of
18 overheads. The copy that I have for the exhibit, I
19 have marked with letters. There are 15 pages, so the
20 letters are A to O.

21 THE CHAIRMAN: Okay. Exhibit 620
22 starting with A going through to O.

23 MS. MURPHY: (handed)

24 ---EXHIBIT NO. 620: Copies of overheads to be used by
25 Mr. Galloway in evidence-in-chief
(A to O).

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MS. MURPHY: The next document is one
entitled: Summary of Documented Complaints Received by
MNR Districts with respect to Pesticide Use in Forest
Management, 1984-1988. The document was prepared by
Mr. Galloway and Mr. Buss and is dated May 31st, 1989.

THE CHAIRMAN: Exhibit 621.

MS. MURPHY: (handed)

---EXHIBIT NO. 621: Document entitled: Summary of
Documented Complaints Received by
MNR Districts with respect to
Pesticide Use in Forest
Management, 1984-1988 prepared by
Messrs. Galloway and Buss dated
May 31st, 1989.

MS. MURPHY: And the third document, this
is the final one, is a document entitled: Number of
Reported Injuries and Days of Lost Time for MNR
Chemical and Manual Tending Operations in the Area of
the Undertaking for the period 1980-1988. And that
document is dated May 31st, 1989.

THE CHAIRMAN: Okay. Exhibit 622.

MS. MURPHY: (handed)

---EXHIBIT NO. 622: Document entitled: Number of
Reported Injuries and Days of Lost
Time for MNR Chemical and Manual
Tending Operations in the Area of
the Undertaking for the period
1980-1988 dated May 31st, 1989.

MS. MURPHY: And just one reminder, Mr.

1 Galloway will be referring to a diagram which was
2 provided in his statement of evidence. The diagram was
3 originally on page 156. The diagram has been amended
4 and was provided with Exhibit 605. Just as a reminder
5 when he gets to that.

6 THE CHAIRMAN: Thank you.

7 CONTINUED DIRECT EXAMINATION BY MS. MURPHY:

8 Q. Mr. Galloway, I understand your
9 speaking to Document No. 2 in this panel. That begins
10 at page 147?

11 MR. GALLOWAY: A. That's correct.

12 Q. And the title of that document is:
13 Report on Cleaning by Aerial and Ground Herbicide
14 Application for Conifer Release?

15 A. Correct.

16 Q. And would you just explain how you
17 have gone about preparing to give evidence today?

18 A. Similar to Mr. Hynard, I have taken
19 the details from the document in the evidence and
20 structured it for the interest of the -- that occurred
21 in the interrogatories and issues and focused this oral
22 evidence to cover those issues.

23 In order to do this, I will try to answer
24 four basic questions. The first overhead.

25 Those questions that came up quite often

1 in interrogatories and issues are, first: How are
2 cleaning decisions reached and how are immediate
3 results assessed.

4 Second: What are the alternative methods
5 of cleaning, and this is specific to the boreal conifer
6 Mr. Hynard has already spoken on some of the other
7 tending methods in the Great Lakes/St. Lawrence.

8 Why is the aerial application of
9 herbicide the most common method of cleaning, again,
10 within that boreal conifer.

11 And, fourth: What is the importance of
12 aerial application of herbicide in the boreal forest.

13 So why I am focusing on that boreal
14 cleaning is it's the major tending treatment in the
15 boreal forest. As Mr. Hynard said, 87 per cent of all
16 tending in the province is that ground or aerial
17 application of herbicides, but I also do look at and
18 evaluate manual cleaning within that boreal forest.

19 To start then with the first question of:
20 How are cleaning decisions reached. Next overhead.

21 From the point of view of the forest
22 manager, vegetation management must achieve certain
23 objectives. So this overhead Effective Vegetation
24 Management must then control the competition for the
25 desired period and, as Mr. Campbell and Mr. Hynard

1 said, that's normally to the free to grow period.

2 The treatment must avoid creating a worse
3 problem, it also must avoid removing access to supply
4 of wildlife forage - and Mr. Buss will be going into
5 more detail than I will on that - it must avoid erosion
6 and siltation problems. I will be speaking to that in
7 the evaluation of the different treatments, but Ms.
8 Krishka will be discussing that in more detail. And it
9 must remain within the limits of reasonable cost and
10 risk.

11 Q. I understand you are using that
12 diagram I was referring to, the one that is on page
13 156.

14 A. That's correct. It's Figure 1 in
15 that statement of evidence. And, again, this was
16 created by me and there was interest through the
17 interrogatories expressed on how these decisions were
18 made and how information was gathered to make those
19 decisions.

20 I prepared this diagram mainly to outline
21 in an easy method the decisions. It's similar to one I
22 prepared in the jack pine silvicultural guide and it
23 also shows up, a similar type diagram, in the spruce
24 and poplar silvicultural guides. And generally it's
25 just a method of expressing in simple form the process

1 that a forest manager would go through both at the
2 predictive level with a five-year plan and parts of it
3 would be in detail at that time and parts would be much
4 quicker and at the annual project proposal stage. And
5 this -- again, it just allows that process to be
6 described and it's what I do and what would be a common
7 process for a field manager -- forest manager.

8 The first major point then is to assess
9 that current state of regeneration. So before any
10 cleaning treatment you have to know if there is enough
11 regeneration there that makes it viable to treat and it
12 has to -- if it's required for a maintenance. This is
13 done -- excuse me, this would be done after renewal and
14 prior to that maintenance treatment and when the
15 competition is seen or anticipated to be affecting the
16 crop trees, and this is based on past experience and
17 knowledge of that area.

18 The next overhead would outline how the
19 tools are used to provide information so that you can
20 assess the state of that regeneration. For example,
21 Ministry of the Environment asked in the
22 interrogatories how the forest soils would be assessed
23 when thinking about applying hexazinone. And these
24 tools are available to the forest manager and I will
25 just describe each one briefly.

1 Aerial photographs are used to give an
2 overall visual view of the area and do some preliminary
3 stratification. They will delineate some of the crop
4 trees, although it depends on what size they are at and
5 they will show generalized vegetation, if it's in the
6 form of shrubs. It will not show the grass and
7 raspberries, for example.

8 The next tool is just a visual survey and
9 that can be done either from the ground or from the
10 air. And, again, this is just a quick way of
11 determining if there is sufficient regeneration there
12 and how the competition is affecting it.

13 Other information available is the soils
14 and site information. You have previously heard about
15 forest eco-system classification, prime land, soil
16 classifications, soil surveys and a shovel. For
17 example, the forest manager can, on the site with his
18 shovel, evaluate the soil and determine the texture and
19 moisture regime, for example, and that allows him to
20 make some predictions about the need for tending.

21 These first three items, especially the
22 first two, are especially good when the answer is
23 obvious. So on the first view it either does not
24 require cleaning or needs it obviously.

25 If more detail is needed and the answer

1 is not so obvious, a ground survey of the crop trees
2 and competition might be required and this would be
3 similar to the stocking survey described by Mr. Waito
4 in Panel 11. And from that kind of survey you can get
5 a quantified number that evaluates both the crop and
6 the competition.

7 The forest resources inventory also
8 provides background information. The information about
9 the past stand allows the forest manager to predict the
10 likely response and need for cleaning.

11 A relatively new technique and low level
12 infrared photography is being use within the cleaning
13 program and is coming into more common use, but at this
14 point it is still not common. But, again, it can be
15 also quantified and gives a numerical answer as to the
16 amount of competition and to the crop trees.

17 The past experience and experience of
18 peers that Mr. Hynard mentioned also is of extreme
19 value in these decisions.

20 Just going back to the decision chart.
21 After these tools have been used, you have to determine
22 if there is acceptable stocking level there to justify
23 the cleaning treatment and, as mentioned, that was
24 previously described by Mr. Waito in Panel 11.

25 The question the manager must ask himself

1 here: Are there enough to justify this treatment. If
2 the answer is no, then you would retreat with the
3 renewal treatment or accept that existing regeneration
4 that's there. That retreatment would be, if can be
5 done at reasonable cost and effectiveness. You might
6 still decide not to retreat and accept the existing.
7 For example, if you had 30 per cent of the desired crop
8 trees and if that was jack pine, for example, and 70
9 per cent aspen, the extra money spent to retreat might
10 not justify the expected results.

11 If the answer is yes, there is acceptable
12 stocking, you move on to the next box on the chart and
13 this question: Is the competition reducing or expected
14 to reduce the crop performance significantly? If the
15 answer is no, then there is no release required.

16 If the answer is yes, and the yes answer
17 would commonly occur on the most productive sites, as
18 described by Mr. Hynard, and where the competition for
19 that light, moisture and nutrients in growing space is
20 most significant. An example here would be if it was
21 jack pine, being an intolerant species, had significant
22 competition or was expected to, it actually might not
23 survive; whereas black spruce, being more tolerant,
24 would probably live but the growth of that would be
25 reduced significantly.

1 At the same stage, the choice of
2 products, as described by Mr. Campbell, and their
3 expected results are also considered.

4 Q. Are there any predictions required in
5 this box at any point in time?

6 A. Yes. At the time you are doing this
7 you are still predicting, based on those tools, the
8 expected need for the treatment and, as Mr. Hynard
9 said, until you have that final field inspection before
10 the project proceeds you are still in a predictive
11 nature, whether you are at the five years or even at
12 the annual work schedule time frame.

13 Proceeding down to the next box at the
14 bottom. You have determined that the competition is
15 going to reduce or expected to reduce the crop, now you
16 have to know whether those crop trees will respond to
17 release. There is no justification for the project
18 proceeding if the trees are not in a suitable state of
19 health to respond.

20 For example, if this had happened too
21 late in the development of that stand, the trees might
22 have such a sudden shock with the release that you
23 actually may create a worse problem and totally
24 eliminate them from that site. And this would be
25 whether it was just elimination of the overtopping

1 vegetation and the trees might not be able to adapt to
2 that new -- the new availability of light.

3 MR. MARTEL: How do you determine that,
4 that it is too late and that you better not release it
5 otherwise it will -- how does a forester come to that
6 conclusion?

7 MR. GALLOWAY: Using those tools that I
8 described earlier, specifically that would have to be
9 with a detailed ground survey. When you are doing that
10 survey you would also check the health of the crop
11 trees, as well as just the number and where they were
12 located. And by having a health class there, then you
13 have an idea if we do proceed with this project are
14 these trees healthy enough to be able to use the
15 increased resources that you have made available by
16 using the cleaning treatment.

17 MR. MURPHY: Q. Are there any kinds of
18 situations where you might expect that? Would there be
19 any clues or queues to you about the kinds of
20 situations where you should be looking for that
21 potential problem?

22 MR. GALLOWAY: A. Yes. If, as described
23 and shown by Mr. Campbell, that site where the grass
24 was so far above the trees and if you hadn't -- had
25 done it at that time it in fact would lay down on top

1 of the trees when the snow came and the trees in there
2 would show definite health problems; for example,
3 reduced needle length, off-colouring, that kind of
4 indication. If they won't respond, you accept the
5 existing regeneration that's there.

6 If yes, you proceed to the next step.
7 This is still on the same page in the evidence, we have
8 just broken it up so the overhead will show up better.
9 At this stage you have determined that release is
10 necessary, then you need to set some objectives and
11 standards now for the program.

12 This again is the role of the forest
13 manager to set these and there is a predictive element
14 at this stage as well. The manager would consider the
15 kind of competition that is there, similar as Mr.
16 Campbell indicated, grass versus alder, for example,
17 the size of the program and that's -- the size of the
18 problem, and that affects the immediate site that you
19 are viewing there and the forest level. If that's the
20 only place with a problem, you would have a different
21 answer than if it was occurring on a broad area of your
22 renewal projects.

23 Then expected response from the various
24 treatments, so each treatment would have a different
25 response, probability, and that response would temper

1 your decision. The long-term management objectives
2 from the timber management plan for that site, for
3 example, the expected growth rate, volume production,
4 stocking species mix that you are trying to achieve on
5 that site, they would show up in the timber management
6 plan.

7 And another example, if that was being
8 tailored for a jack pine/aspen site, you would have a
9 different choice of your options as opposed to if it
10 was being tailored for a pure jack pine site.

11 That final set of standards would be in
12 the form of a performance standard for the person doing
13 the treatment. For example, if it was manual tending
14 the standard would usually be expressed in a per cent
15 removal of stems or competition for the particular
16 species you really would like to remove; and if it was
17 for an application of herbicides, it becomes a decision
18 re the product, timing and application rate that you
19 would choose. And some of Mr. Campbell's pictures and
20 that showed the different effects each of those would
21 have.

22 That objective then would show up as well
23 as in your contract administration in the project
24 description for the annual maintenance cleaning
25 project.

1 Q. I understand the project description
2 will be explained later on in the evidence of Mr.
3 Iskra, for example?

4 A. That's correct, as a detailed example
5 of an actual project.

6 So we have arrived now at this stage.
7 The next decision is to evaluate and choose the
8 options. I'm going to -- the section that now shows up
9 on the overhead, just the evaluate and choose options.
10 decision, along with the appropriate arrows and
11 feedback of that analysis, I will deal with in a few
12 minutes in much more detail. But at this time, I will
13 just quickly highlight those options that we will be
14 discussing, that's the manual cleaning, chemical
15 cleaning for ground -- on the ground, and chemical
16 cleaning by aerial method.

17 Okay. So since we are going to come back
18 to that section in a few moments, the next box on the
19 chart is you implement your choice. At this point
20 there is further process requirements that would also
21 interact with this decision. For example, the planning
22 and operations of the annual project that Mr. Iskra
23 will be discussing and the annual work schedule
24 requirements, that will also be covered by Mr. Groves
25 in Panel 15.

1 There are rare times when you arrive at
2 this implementation state when you might not be able to
3 implement the choice or any of the options and that
4 could be, for example, where no funds were available,
5 as Mr. Hynard already described, and the project would
6 have to be deferred to another year.

7 Another one might be where there is an
8 outstanding unresolved concern either that came up
9 through the timber management planning process or as a
10 result of the annual herbicide planning process.

11 Q. Up to now you have been explaining
12 that some of these decisions obviously involve
13 predictions, and I wonder if you can tell us: Prior to
14 harvest, for example, we are looking very far into the
15 future, can you predict the areas that you think will
16 need cleaning?

17 A. To a large degree and on the broad
18 scale, yes, you can. For example, those areas that
19 have been or expected to be harvested and renewal
20 treatment has occurred or expected to occur, would
21 predict the areas that you would be allowed -- or would
22 require, not allowed, but require a cleaning treatment.

23 Also, based on the tools and information
24 I described, you would have a general knowledge of
25 those areas that are susceptible to competition from

1 the experience of yourself and your peers on that unit
2 and the support staff and knowledge of the soils and
3 sites on that management unit.

4 And Mr. Hynard's picture of the
5 productive red pine site with no competition underneath
6 versus -- or with lots of competition underneath versus
7 that unproductive site that had no competition
8 underneath are an example of that.

9 And, in general terms, the unit manager
10 could predict that in advance to a degree and, in fact,
11 would want to predict that need for tending in order to
12 engage in the long-term strategic planning, part of the
13 timber management plan. Of course, as Dr. Osborn
14 stated in an earlier panel, the further down the road
15 that prediction is the less reliable it is, and other
16 factors affect those predictions.

17 So the actual need to treat an individual
18 case must be made with more information available and
19 you would have to assess that need on the basis of what
20 actually happened on the site.

21 Competition is controlled by weather and
22 other uncontrollable factors, for example, and the
23 variability in the actual site disturbance, whether the
24 area had been harvested in winter or summer affects the
25 level of competition. What kind of site preparation

1 took place on that area also would effect the level of
2 competition. Therefore, you need to maintain that
3 flexibility and, as Mr. Hynard described, decide with
4 the last final field visit the yes or no of that
5 project.

6 Q. Well, if you know -- if you can
7 generally predict the areas, would you also be able to
8 generally predict what your preferred option is going
9 to be?

10 A. In general terms, yes, you could,
11 because from the forest resources inventory you know
12 the working group of that site before, you would have
13 an idea from your experience on that area generally of
14 the areas that you would expect the cleaning would be
15 required.

16 Some operational concerns would also
17 outline the treatment that would be required. Large
18 areas, for example, would likely be treated by aerial
19 herbicide application in the boreal forest. A smaller
20 area near an area of concern would almost, with a high
21 probability, have another treatment type at that time.

22 Q. Well, without going into a lot of
23 detail on it because the Board is going to be hearing
24 evidence in Panel 15, can you advise whether any of
25 those predictions would be engaged in at the time of

1 doing the timber management plan?

2 A. Some of them would be. The timber
3 management planning process does outline the five-year
4 forecast for maintenance needs are predicted, it
5 outlines on the map of renewal and maintenance where
6 those maintenance operations would occur.
7 Prescriptions in the normal operating areas would show
8 optional treatments available in the silvicultural
9 groundrules. And in an actual area of concern, an area
10 of concern planning process would have occurred and an
11 actual prescription would show up in Table 4.12, for
12 example, of the timber management plan.

13 And in Table 4.19, which is the summary
14 of forecast of predicting operations, you would
15 actually have a summary by working group of the
16 maintenance treatment type in general terms again, and
17 the forest manager would actually need to have that for
18 his planning at that stage and for normal business
19 decisions of budgeting and on-going programs as well.

20 Q. So at that stage then you have some
21 general predictions. Is that refined down at any point
22 in time?

23 A. Yes. As you get closer to that
24 actual operation you would have the operational
25 planning, as will be described by Mr. Nicholson and

1 Iskra, where you actually have your project plan and
2 description at different details depending on aerial,
3 ground or manual choice.

4 And the annual work schedule is produced
5 and is available on April 1st of each year where people
6 can come and look at the areas, and they will be
7 outlined at that stage, or could in fact just telephone
8 in and identify an area to you on the phone and you
9 could alleviate some of those concerns or describe to
10 them what was going to happen near the area that they
11 might have an interest in. This is still predictive
12 even at that stage.

13 Q. What do you mean by that? You are
14 saying at that stage in the annual work schedule the
15 information is still predictive to some degree. Could
16 you add to that?

17 A. Yes. You would have -- the previous
18 year you would have had, using the tools I described,
19 determined an anticipated need for a cleaning project,
20 but other items -- other things can happen in the
21 season before the actual project occurred; for example,
22 a severe frost or something of that nature might occur
23 in the spring and then the need for treatment might
24 change.

25 Q. So in those situations, are those

1 things that are planned and then aren't carried out?

2 A. Yes. In a situation like that you
3 would have areas identified and, in fact, might reduce
4 the actual area that would require any tending
5 treatment at that time because of an unforeseen
6 situation such as weather.

7 MR. MARTEL: Well, if you go beyond
8 your -- at what stage then in the work schedule? You
9 know this year's work, you have last year's plan, where
10 in fact do you decide it is time to make the final
11 decision to proceed?

12 MR. GALLOWAY: Right. That third notice
13 then would occur where, as will be described for a
14 project in detail by Mr. Iskra, where the actual aerial
15 or notice of those projects would be done.

16 MR. MARTEL: I mean prior to that,
17 though? Excuse me, maybe I'm not explaining myself
18 carefully.

19 You indicated just one moment ago that
20 you start really almost a year ahead of time, then you
21 have your annual work schedule for this year, there is
22 a work schedule for work that is projected for this
23 year.

24 MR. GALLOWAY: That's right.

25 MR. MARTEL: At what stage do you decide:

1 We are going to proceed with tending, we are actually
2 going to proceed, there is no more prediction, there is
3 no more guessing, we decide we are going to proceed.
4 Where does that trigger in?

5 MR. GALLOWAY: Actually it would be at
6 that stage in the annual work schedule, except for
7 extreme cases.

8 MR. MARTEL: Okay then.

9 MS. MURPHY: Q. What factors would enter
10 into that final decision, those extreme cases?

11 MR. GALLOWAY: A. For example, if a
12 concern was issued -- or was identified, you in fact
13 would have planned an annual work schedule to proceed,
14 but a concern or something might have occurred that you
15 had not been able to predict and that would be rare.
16 But the factors of weather, for instance, or a concern
17 identified by someone else in an area might at that
18 time actually cancel the project.

19 Q. And these notices you are explaining,
20 and they will be explained in more detail, but is it
21 your experience that the Ministry of Natural Resources
22 gets responses to those notices?

23 A. Yes. We would -- it is quite
24 frequent that a unit manager would have a response to
25 those notices and, in fact, to outline that is why we

1 gathered up some of those complaints or calls in that
2 we have summarized.

3 Q. Yes.

4 MS. MURPHY: That was the document that
5 we marked earlier, Mr. Chairman, as Exhibit 622.

6 Q. I understand you were involved in
7 looking at some documentation and putting together this
8 summary?

9 MR. GALLOWAY: A. That's correct. We
10 created this -- to answer some of these questions we
11 created this summary of documented complaints received
12 by the MNR districts with respect to pesticide use in
13 forest management from 1984 to '88.

14 In order to do that, a request was sent
15 to all MNR districts, the district offices were asked
16 to review their files, to locate all documented
17 complaints with respect to pesticide use in forest
18 management and that request, as outlined here, asked
19 for information that would identify where that
20 complaint came from and where it had occurred, who the
21 complaint was from, when the complaint had been, the
22 nature of the complaint, and the action results taken.

23 This information was received from
24 district offices, was reviewed by myself and Mr. Buss
25 and complaints were categorized by the type of

1 complainant, the type of concerns, that is the major
2 identified issue, and the action resulting that
3 happened.

4 This information is based on documented
5 complaints only and it will not include many personal
6 contacts by telephone or otherwise that a unit manager
7 might have had. For example, in my experience, you
8 would have -- generally when a notice would go in the
9 paper you would have telephone calls and/or short
10 letters asking for information that could be answered
11 quite quickly and some of those details might not show
12 up in this summary.

13 And the information does not reflect
14 documented requests for information that was not a
15 complaint and, as Mr. Hynard mentioned, it would not
16 include such matters as a request for spraying.

17 Just a quick look at that summary.
18 Again, it is from the districts and this means that a
19 general complaint that had been identified to our main
20 office or our regional office would not show up in
21 here. The identification of who the complaint came
22 from and the numbers of that and a per cent of that is
23 there, that major identifiable concern or issue, and
24 there is some people with more than one concern. So
25 that those percentages don't necessarily add up to the

1 same as the one above because some people might express
2 more than one concern in the same contact, and a
3 percentage of the estimate of the type of concern that
4 was -- that occurred.

5 Q. I note, Mr. Galloway, you had a
6 comment to me about that number, 93. Did you want to
7 make some comment about that?

8 A. Yes. I would expect in that year and
9 across the whole province that would be low. I am
10 surprised that it is that low. And, as I mentioned
11 earlier, I think that is because some of the general
12 telephone questions or fast answer letters would not
13 show up in this type of reporting; whereas one where
14 someone, for whatever reason, had approached the
15 district more than once or had a more serious concern
16 that had to be looked at in more detail, would show up
17 here.

18 The action results part of it, we just
19 summarized the ones that were resolved by the type of
20 resolution. For instance, information/education,
21 either by letter or personal contact, is by far the
22 largest resolution. Now, some of those letters we
23 would send an answer back to someone and if in fact
24 they never responded to us again, then we would not
25 really know if it was resolved or not, but would assume

1 that it had been resolved.

2 In some cases, there was a definite
3 answer that it did not resolve it and that's noted down
4 in the unresolved.

5 THE CHAIRMAN: Mr. Galloway, when you
6 look at that figure 93, and you mentioned you think
7 that's low for that year; is it not --

8 MR. MURPHY: For those years, yes.

9 THE CHAIRMAN: Yes, the period 1984 to
10 '88?

11 MR. GALLOWAY: That's correct.

12 MS. MURPHY: That's right.

13 THE CHAIRMAN: So you think 93 is low for
14 that total period?

15 MR. GALLOWAY: That's correct. And the
16 reason for that I think is that the recording of some
17 of those concerns that were answered immediately by
18 telephone or something like that; whereas any serious
19 concerns or items would have been documented and we
20 were able to gather information.

21 THE CHAIRMAN: Is there any trend in any
22 way in terms of individual years, like 25 a year or 30
23 a year or something like that?

24 MR. GALLOWAY: I am trying to think of
25 that. In general it is roughly the same amount. In

1 fact, some of the people, the beekeepers, for instance,
2 was identifiable, actually the same organization, the
3 same district two years in a row expressed their
4 concern and that was identified within the project and
5 that shows up in some of the other situations.

6 THE CHAIRMAN: Thank you.

7 MR. GALLOWAY: You will note in some of
8 the referred classes, referred to Department of
9 Transport, and their interest obviously is within
10 aerial where their rules apply to the aircraft. And
11 the actual project cancellation is a very minimal
12 amount and that would be expected because most of the
13 issues would also -- would already have been identified
14 within the TMP process and the annual notice process
15 and the annual work schedule process.

16 And, in fact, there are some really, you
17 know, valid reasons that the forest manager would want
18 to identify that as well. Biologically, if you had to
19 defer something at the last moment you would reduce
20 your survival and/or growth and yield, as expressed by
21 Mr. Hynard.

22 And silviculturally, this is -- those
23 treatments are part of a package, so the renewal
24 package that occurred would depend on a follow-up
25 treatment. So from the forest manager's viewpoint, all

1 issues that can be identified earlier, the better it
2 is, so that you eliminate those surprises or last
3 minute issues that might arise.

4 MS. MURPHY: Q. And were -- these
5 complaints that you were looking at, were they ones
6 that tended to arise outside of the identification of
7 areas of concern in the timber management planning
8 process context?

9 MR. GALLOWAY: A. Yes. Some of these
10 were identified as an area of concern in the timber
11 management planning process, but the majority of these
12 were responses to either the pesticides or the
13 herbicides -- the insecticide or herbicide specific
14 request for information, and those notices that would
15 go in the paper that Mr. Nicholson and Iskra will be
16 talking about further.

17 Just on a business contract, the forest
18 manager would also have by that time contracted with
19 whoever would be doing the work, the cleaning projects,
20 and if any cancellations that would occur at that last
21 moment, you might end up paying someone for not working
22 if you had to cancel some at that late moment. And
23 that's why it is absolutely critical to have that
24 identified at the annual work schedule and it would be
25 rare that anything would change at that time.

1 THE CHAIRMAN: Did I understand you
2 correctly that none of these figures include just
3 requests for information?

4 MR. GALLOWAY: No, it is not quite that
5 clear cut. Some of them would include -- some of those
6 information/education ones, but I would expect that
7 that number -- in my experience, that number would be
8 larger. So that the -- for instance, in recalling it
9 from the districts, they might not have been able to
10 identify in that period all of the requests just for
11 information where it was just a call in. They would
12 have all the ones in the timber management planning
13 process, they would be documented and a specific notice
14 would be documented.

15 Again, in my experience, these would be
16 typical type concerns and resolutions that occur.

17 MS. MURPHY: Q. But the request that
18 went out did ask for information about complaints
19 specifically?

20 MR. GALLOWAY: A. Yes.

21 Q. Looking back at your chart then,
22 assuming that you have gotten to this point and you
23 have implemented your choice, where do you go now?

24 A. Okay, where are we. Okay. The next
25 spot below then the information -- the choice, is to

1 assess the results. And Mr. Hynard discussed this in
2 detail and he mentioned that it's not as formalized as
3 the assessment of renewal results, but the forester
4 manager does have to assess the results of their
5 treatments.

6 For example, immediately: Did you
7 achieve what you planned to achieve, was the
8 competition reduced on that site by whatever treatment
9 you had chosen. And that is normally done by a simple
10 visual observation, again, in the obvious cases.

11 You might have to do a -- complete a
12 ground survey as discussed before if the answer wasn't
13 that obvious. An analysis of the records of the
14 operation, discussion with staff on those projects
15 would allow you to identify problems, safety issues,
16 planning problems, cost overruns, and that would all
17 feed back into the evaluation criteria that I'm going
18 to speak in detail, again, and that information is
19 essential to the annual upgrading of information
20 available to make those decisions and could -- in fact,
21 in the next timber management plan, silvicultural
22 groundrules maybe would be changed to reflect some
23 knowledge that occurred on the actual implementation.

24 If you assess that results and it's
25 ongoing all the time, at the time you also make a

1 decision: Is this plantation renewal area now free to
2 grow and if, yes, it enters the new inventory and if,
3 no, would revert back to the top again for the same
4 type thought process to occur.

5 This experience and feedback information
6 would come, as I mentioned, from the records - in an
7 average management unit the unit manager would have 5
8 to 10 of those projects per year - and you would also
9 learn from your peers on other units in areas that were
10 doing similar type projects in similar conditions.

11 Mr. Hynard mentions the on-going training
12 courses, seminars, research library that is available
13 as well. The silvicultural guides, the information in
14 them is useful for people who are either new or new to
15 that area to have a better starting point.

16 So at this time I would like to revert
17 back just to that evaluate and choose options section.
18 So at this decision place the forest manager has the
19 options basically of manual cleaning, chemical cleaning
20 by ground and chemical cleaning by aerial. And these
21 three techniques have been discussed a little bit
22 already by Mr. Hynard and Mr. Campbell and I will
23 specifically look at the evaluation that would occur at
24 that time. And in that aspect, evaluation will be
25 under operational feasibility, effectiveness, cost,

1 worker safety and environmental effects.

2 The environmental effects one I will be
3 mentioning things but Ms. Krishka and Mr. Buss will
4 also be -- and Mr. Kingsbury will also be adding areas,
5 information will come up in their reports as well.

6 To move to the next overhead then, which
7 would be to look at manual. These categories were
8 identified in the witness statement but there was a lot
9 of interest expressed in this procedure, so that is why
10 we are stressing it here again.

11 For manual cleaning, for example, under
12 operational feasibility it's limited by competition
13 type. As Mr. Campbell said, some competition of grass
14 and raspberries, you cannot do on a manual basis.
15 There is certain crop damage can occur, again depending
16 on the technique used on that site.

17 There is seasonal restrictions, for
18 example, you can't cut the competition down to the
19 ground level if it's in fact covered by too much snow
20 that you can't get there. That also hinders an access
21 restriction in the winter where you can't get to an
22 area, or these areas are typically completed after the
23 renewal stage two or three years, then you may not be
24 able to arrive at the sites because of road
25 deterioration to get that many people into an area.

1 Q. What about areas that were operated
2 on in the winter using winter roads. Does that have
3 any effect on that?

4 A. Yes, definitely. In that case there
5 would be no road that you could move in people or
6 equipment at all. The labour force required here.
7 Manual cleaning requires a labour force to be available
8 and the work typically occurs also in the same time as
9 tree planting and other seasonal labour, for example,
10 tourist lodges and you need a fairly high number of
11 people and it's for a fairly short working season and
12 because of that they tend to be unavailable and it's
13 difficult in certain areas to find a sufficient labour
14 force.

15 Cost productivity. Just quickly \$400 per
16 hectare for this treatment and roughly half a hectare
17 per person day.

18 The effectiveness. It often requires
19 retreatment and, in my experience, effective control
20 would be only for one season at the most and
21 retreatment would have to occur. The control does not
22 last long enough for the crop trees to benefit. It can
23 occur as often as three times or more on any one site.
24 It does not control the coppice growth or root
25 competition because that has not been eliminated by the

1 manual removing of the top. And in fact, as Mr.
2 Campbell said, can actually stimulate growth in that
3 area.

4 It's good for small accessible areas
5 where, for instance -- or near another value where the
6 prescription had eliminated other techniques and where
7 the cost and increased labour and that justifies the
8 area in that case.

9 The worker safety part, the risk of
10 injury is highest in this treatment type and extensive
11 training is required.

12 Q. You filed a document that deals with
13 that, Mr. Galloway, and perhaps we should just refer to
14 it now.

15 MS. MURPHY: I believe you marked that as
16 Exhibit 621, Mr. Chairman; is that correct?

17 THE CHAIRMAN: No, it would be 622.

18 MS. MURPHY: Oh, 622. That is the
19 document.

20 Q. And that document was prepared in
21 response to a couple of interrogatories, in particular,
22 one from Forests for Tomorrow; is that correct?

23 MR. GALLOWAY: A. That's correct.

24 Q. And were you involved in preparing
25 this document?

1 A. Yes, along with various other
2 peoples, we prepared this summary.

3 This was, as you said, a recent response
4 to interrogatories and it's the best to date and it was
5 done on relatively short notice but, in my personal
6 experience, it indicates even more so than I thought it
7 might some of the concerns that manual cleaning program
8 has.

9 So this is a number of reported injuries
10 and days of lost time - and lost time is used to
11 indicate seriousness of injury here - for MNR chemical
12 and manual tending operations in the area of the
13 undertaking for the period 1980-1988. And I stress the
14 MNR because of the short time frame and records, this
15 is not projects that were contracted out because we
16 would not have some of that information and it does not
17 represent areas on forest management agreements, again,
18 because we in this short time frame could not gather
19 that information. Just a quick summary on it. And, as
20 you can see, it's broken down by region by the
21 different techniques.

22 The other manual tending technique refers
23 to a stand improvement type work that Mr. Hynard
24 discussed and, in fact, does not affect a cleaning
25 treatment that I am talking about.

1 Just in summary, the aerial -- incidence
2 of aerial is quite low and the same for ground and, in
3 fact those injuries, as the note at the bottom states,
4 may actually be higher than actually happened because
5 we have included six cases of alleged exposure that,
6 for one reason or another, we could not prove that
7 actually had been exposure. It also includes one
8 sprained back and one sprained ankle in there and only
9 the sprained back and ankle resulted in verified
10 injuries which caused no one lost time.

11 And you see, as I would suspect, based on
12 my experience as well, that the manual cleaning
13 injuries occur in that technique and in fact result in
14 significant lost time to the worker on that site. And
15 that would not be a surprise because you are using
16 rough terrain, there's travelling over rough terrain
17 using sharp equipment and very labour intensive. It
18 takes place over a longer period of time. You would --
19 injuries in here could also have resulted from vehicle
20 accident travelling to the site on forest access roads.
21 And generally they are cuts, falls, back injuries, that
22 type and there is a summary attached to that as well
23 which I won't discuss at this time.

24 Okay. To the environmental effects.
25 Economic effects and, in all cleaning, affect the

1 long-term wood supply and, therefore, the long-term
2 economic viability. And this is the same for
3 regardless of which technique you use, if the cleaning
4 occurs, you have those benefits as predicted for the
5 long term wood supply.

6 Short term income benefits occur by
7 hiring the amount of people that are needed for this
8 type of project.

9 Erosion/siltation concerns will be
10 discussed by Ms. Krishka but, in general, would be
11 minimal here because all you have is people walking on
12 the site.

13 Aesthetics, again is minimal. The trees
14 that are cut down would be laying scattered through the
15 area.

16 And indirect effects on wildlife occur
17 such as food and shelter changes and Mr. Buss will be
18 covering more of that in his evidence.

19 The next overhead will indicate the
20 chemical ground application. Just because of the space
21 there is two overheads here in a row that will cover
22 chemical ground application.

23 Operational feasibility. Similar access
24 restrictions occur as with the manual. Winter access,
25 for instance, you have to be able to move in heavier

1 equipment, as indicated Mr. Campbell's slides, to the
2 site so summer access is required. It's limited by the
3 rough terrain, logging debris and residual trees that
4 are left on the site. And, as indicated by Mr.
5 Campbell, it's difficult because of that terrain and
6 debris to achieve the even coverage as the equipment
7 moves up and down over that site.

8 You can have mechanical damage to your
9 crop trees from the equipment moving over the site.
10 With this equipment there's a higher volume of spray
11 but that -- as Mr. Campbell again indicated, that is
12 not a higher amount of active ingredient but higher
13 volumes are sprayed on there.

14 The same seasonal limits for the
15 herbicides apply as in the aerial application of
16 herbicides. For example, it must be done once the
17 trees have hardened off and the competition is still
18 susceptible to the herbicide. It's good for smaller
19 areas similar to manual where you had another value for
20 example, or a small block that would occur.

21 It's also good for selective operations
22 that might occur along a stand boundary. For example,
23 if you had a jack pine/conifer stand and it bounded up
24 against an aspen stand, then you could direct it
25 directly beside that and it would not affect that aspen

1 stand at all.

2 The cost and productivity of this
3 treatment is roughly \$200 to \$300 per hectare and you
4 would achieve 5 hectares per person day.

5 The effectiveness of it is similar to
6 aerial herbicides, as already partly mentioned by Mr.
7 Campbell. There is a slightly higher risk of crop
8 damage and that relates to the uneven terrain and the
9 rate that it might spray at any one location. There is
10 an increased risk of mechanical damage to the crop and
11 the mechanical damage to the competition also hinders
12 the uptake of the herbicides.

13 We already went into detail on worker
14 safety. There is a little higher worker exposure here
15 because they are working right on ground with the
16 herbicide, wearing uncomfortable clothes and gear
17 during it, and the risk of injuries - although didn't
18 show up in the injury report - you have the people
19 right there on the site, again, over the rough terrain
20 and debris. So it's a little higher than the aerial
21 application.

22 And licensing is required to mitigate and
23 control any worker safety issues that might happen and
24 the person licensed, that applicator has to be on site.

25 Environmental effects. The same economic

1 effects of wood supply occur. There's a reduced amount
2 of any short term income because of a reduced workforce
3 on the site.

4 The erosion/siltation would only be a
5 concern if the machinery had actually affected the site
6 and that is not very likely if it's applied correctly.

7 The aesthetics are similar to aerial
8 herbicide, the leaves of the competition would turn
9 brown.

10 The toxicity concerns for human/wildlife.
11 As Mr. Campbell says, only registered products and it
12 would be similar, except there is a little greater
13 concern for spills. The equipment travelling over this
14 rough terrain is susceptible to overturning and may in
15 a specific location spill. And the same indirect
16 effects on wildlife occur and further detail of that
17 will come from Mr. Kingsbury.

18 The next overhead then on chemical aerial
19 application. You have uniform coverage and because of
20 that uniform results. The vehicle, as Mr. Campbell
21 described it, is not affected by the terrain and/or the
22 debris. It's not restricted by access to the same
23 degree, the aircraft can get to those winter harvesting
24 sites. It's not labour intensive. Large areas can be
25 completed in a short time frame which is of utmost

1 importance when you are completing the program of the
2 scale we are and with the herbicide window being rather
3 limited.

4 The weather. Detail on weather
5 limitation will be shown in Mr. Nicholson and Mr.
6 Iskra's operational details. There is seasonal
7 limitations, again, of when it can be done and the size
8 and configuration of the spray blocks would affect the
9 cost and results of the project. It's less efficient
10 in small irregular block sizes.

11 Cost and productivity. For 2,4-D, for
12 example, in '86 costs these are, it would be \$40 a
13 hectare; glyphosate is \$135 a hectare. Indications are
14 this year that that price for the actual herbicide is
15 reducing.

16 Productivity, you would have 14 hectares
17 per person day on those projects.

18 Under effectiveness. It controls the
19 coppice growth and vegetative reproduction and,
20 therefore, eliminates the root competition. The slower
21 exposure of crop trees as opposed to cutting the
22 competition right down beside it, can allow an
23 easier -- reduce the shock of the tree to increased
24 life. It's selective if applied by all our rules and
25 regulations and does not affect the crop tree. And

1 there is no mechanical damage to the crop trees or the
2 competition as there would be in the ground
3 application.

4 The worker safety. For this treatment
5 there is a smaller volume in a closed system when you
6 are mixing this and there is -- would not be workers on
7 the ground in direct proximity to the chemical as it
8 was being sprayed. So there is the least risk of
9 injury as indicated in the summary we already
10 discussed. And you have the training of a very small
11 group of people and a very detailed training program to
12 complete these projects. And, again, the licensing
13 requirements are in effect.

14 The economic effects, the same again,
15 wood supply and the income is even less here because of
16 the reduced labour force required on these projects.

17 Aesthetics the leaves would turn brown as
18 well again and would show up like that.

19 Toxicity concerns, human/wildlife. It's
20 only used with registered products again. And indirect
21 effects from vegetation and habitat, and Mr. Kingsbury
22 will be talking to that issue in detail.

23 MR. MARTEL: Could I ask a question.
24 When we were in Kapuskasing a few weeks ago it seemed
25 to me that there was more than just turning brown of

1 the trees -- of the leaves that, in fact, a lot of the
2 trees that were there lost all their foliage and, in
3 fact, were in the process of dying, this was after the
4 cut and people had gone back to treat the area.

5 How much of this substance are we
6 applying and what are the effects on the other residual
7 trees?

8 MR. GALLOWAY: Okay. One part I will
9 answer and I will allow Mr. Campbell to speak to the
10 amounts and where it is.

11 I say it again that the leaves would turn
12 brown. You are correct, in gradually they all fall
13 off, that tree there would die and you would see the
14 sticks remaining of that as it's there. And then it
15 might -- it would in fact also revegetate slowly
16 underneath that as well.

17 MR. MARTEL: But the big ones were dead?

18 MR. GALLOWAY: That's correct.

19 MR. MARTEL: The huge trees.

20 MR. GALLOWAY: That's correct.

21 MR. MARTEL: And that was as a result of
22 the --

23 MR. GALLOWAY: It would be -- the
24 herbicide on that area would result in that as well.
25 The residuals, I assume you are speaking to?

1 MR. MARTEL: Yes. That is why I asked
2 the question about quantity, because to kill trees of
3 that size you must be using a fairly large amount, I
4 don't know, so maybe I will ask Dr. Campbell that.

5 DR. CAMPBELL: The amount of herbicide
6 which is required to kill a large tree is not
7 necessarily that much more than to kill a small one.
8 You realize, a larger tree is going to have a larger
9 surface area of foliage. The important thing, this
10 is -- you may remember, I was talking about controlling
11 the grass with something like Roundup.

12 One of the reasons, if you have got grass
13 that's a perennial grass that has an established root
14 system, if you spray too early in the season there
15 won't be enough leaf surface to absorb enough chemical
16 in order to kill the roots. So, generally speaking,
17 you don't need more to kill larger plant.

18 MS. MURPHY: Q. And Mr. Martel was also
19 asking about the effects on residual trees. Is that
20 related to the evidence you were giving earlier Mr.
21 Campbell about spray windows?

22 I'm sorry, Mr. Campbell and I -- or Dr.
23 Campbell and I both have the same affliction and; that
24 is, we are both a little deaf and I thought I maybe
25 better mention that at least for myself because I will

1 be around for a while and we both have this problem and
2 we have sort of set off a cannon in front of us if you
3 can't get our attention.

4 DR. CAMPBELL: A. And also I had someone
5 talking in my other ear. If you could repeat that,
6 please?

7 Q. My question was that Mr. Martel was
8 asking you about the potential effects on residual
9 trees as well, and I was asking you whether that's
10 related to the evidence you gave earlier about spray
11 windows, the effects of using the product and the
12 effects of them on the trees --

13 MS. MURPHY: Well, when you were talking
14 about residual trees, were you talking about the
15 residuals, Mr. Martel?

16 MR. MARTEL: Yes.

17 MS. MURPHY: Or the once that you wanted
18 to keep?

19 MR. MARTEL: The ones you wanted to keep,
20 trees that you left behind.

21 MS. MURPHY: Yes, the crop trees.

22 Q. So Mr. Martel is interested in
23 knowing whether, when you affect the vegetation that
24 you are trying to affect, are you likely as well to be
25 affecting your crop trees?

1 DR. CAMPBELL: A. Well, this is one of
2 the reasons why you have to be careful about the rate
3 of the chemical that you put on and you also have to be
4 careful about the timing.

5 As I mentioned that the conifers, say,
6 such as spruce, you definitely could damage them if you
7 applied glyphosate before they had become dormant later
8 in the season.

9 MR. GALLOWAY: A. Okay. To proceed into
10 the next question of my first overhead then.

11 Q. Well, if you just want to wait for a
12 minute.

13 MS. MURPHY: I think Mr. Galloway would
14 probably be another 20 minutes or so. Would you like
15 to continue or would you like to take 10 minutes?

16 THE CHAIRMAN: Well, would it be
17 convenient to finish off with him and then take the
18 afternoon break, and then start with the new witness
19 after the break?

20 MS. MURPHY: Certainly.

21 THE CHAIRMAN: Okay. Why don't we do
22 that.

23 MS. MURPHY: Q. Al right, that's fine
24 then. Let's go ahead with the next question.

25 MR. GALLOWAY: A. If you remember the

1 first slide that had the questions we were going to
2 answer, the next question: Why is aerial application
3 of herbicide the most common method of cleaning in the
4 boreal forest and specifically of cleaning conifer.

5 Basically each method has advantages and
6 disadvantages and each method is also not always
7 interchangeable, as Mr. Hynard stated, so that there is
8 not always all three options available.

9 For example, an area of concern where as
10 the prescription was developed a herbicide was
11 precluded on an area, then obviously those options are
12 not available to do, or in the manual case an area
13 where grass and raspberries where the manual tending
14 would be totally ineffective, it is not an available
15 option.

16 But just to look at some of the details
17 quickly as to why aerial application is the most common
18 choice. First of all, just a summary of the costs and
19 productivity. It obviously has a much higher
20 productivity per hectare to complete the projects and
21 that results in the similar cost savings on the area,
22 as this overhead, just as a summary of past evaluation
23 of each treatment.

24 The size of the program in Ontario - and
25 I will show a graph of some trends and Mr. Hynard did

1 show the size yesterday - makes it the only feasible
2 alternative in most cases. Along with that, the short
3 time frame and spray window that's available to
4 complete that program. The unavailability of labour to
5 do these tasks in certain areas is a concern. It's
6 difficult, in my experience, to find enough people to
7 complete the manual tending jobs that we have at
8 present.

9 Access difficulties in much of the area
10 of the undertaking is common and because these projects
11 are going on two, three years after the renewal
12 process, could be more than that, could be five or six
13 years after the harvest when the road was built and, in
14 fact when it was a winter road, as you mentioned, you
15 may not be able to get into the area. There is less
16 risk of worker injury in the aerial applications as
17 shown in the summary we discussed.

18 There is also a less need for a
19 retreatment due to the effectiveness of the herbicide
20 as compared to manual and, in fact, it would be rare to
21 have an area that would be retreated more than once or
22 twice at the most. That would be a rare occasion.

23 The uniformity of coverage on an area
24 compared to ground application is also a critical
25 matter in the choice. This decision then is made on a

1 project-by-project basis and, given all those foregoing
2 issues, aerial is chosen most often both on an area
3 basis and by the number of projects.

4 Just one final point and a couple of more
5 overheads to show. Just because I'm confusing my sport
6 and putting them out at the wrong place here.

7 The importance of aerial herbicide in the
8 boreal forest. I have a few major points to be made
9 there to stress the importance of it. It is the major
10 tending treatment, 87 per cent, as mentioned by Mr.
11 Hynard. It is a part of the silvicultural package,
12 again as mentioned by Mr. Hynard, and in fact the
13 renewal options depend on the follow-up effectiveness
14 of the cleaning treatment.

15 You have to keep that forest growing at
16 the planned rate, as mentioned by Dr. Osborn in Panel
17 4, and the failure to have the release can cause the
18 loss of original investment. For example, the money
19 spent in the renewal program, as outlined in Panel 11,
20 might be lost if there is no follow-up cleaning.

21 Mr. Hynard also outlined how critical
22 tending is and that does not change for the cleaning
23 part of tending. And an understanding of that need for
24 cleaning is developing even more as we understand the
25 long-term wood supply needs and analysis. This

1 activity is taking on an increasing importance as that
2 understanding develops, and Ms. Krishka will be
3 outlining some of the short-term and long-term
4 benefits.

5 The way we think about the need to tend
6 is described quite well in the Baskerville article. It
7 is Panel 12 evidence package on page 174 to 193: The
8 Strategic Impacts of the Failure to Control
9 Competition.

10 Q. And I don't know that you need to go
11 to that paper right now, I think Mr. Galloway will just
12 be reading in two short excerpts.

13 A. The concept generally used to explain
14 this is that tending has an effect at three levels, as
15 the overhead shows. The tree is affected for survival
16 and growth and yield of the individual and, as Mr.
17 Hynard's biscuits yesterday showed us, if you had only
18 one tree growing at that increased rate, you would not
19 have a very successful plantation. If, in fact, all
20 your trees were growing at that rate you would have a
21 successful plantation and an increased stand volume.

22 So the other way it is affected is at the
23 stand level where the volume shows up. Again, that's
24 not -- that may not be of consequence if it is only one
25 of your stands that's not growing at the expected rate,

1 but where it becomes absolutely critical is when enough
2 stands are growing at a reduced rate that affect the
3 long-term forest level supply.

4 Mr. Baskerville in that paper is talking
5 about the potential effects of the forest level of not
6 cleaning, but it also -- the concept is important
7 either way, the importance of cleaning as well. The
8 effect of that series of decisions to treat or not
9 treat is ultimately at that forest level.

10 Just to quote one area, as Ms. Murphy
11 stated, on page 184 at the bottom of the page:

12 "The point is..."

13 Starting there:

14 "The point is that at the forest level,
15 the price of failure to control
16 competition can be substantial. Do not
17 make the mistake of trivializing the
18 importance of controlling competition by
19 looking only at an individual stem or an
20 individual stand for the sake of simple
21 comparison. At the forest level, both
22 forest management control and industrial
23 survival are often at stake."

24 Three quarters of the way down the next
25 paragraph starting with "In the strategic context...":

1 "In the strategic context, it does not
2 matter what the tactic actually is as
3 long as it controls the competition.
4 However, it is not possible to
5 over emphasize the necessity that the
6 chosen tactic must be implementable on
7 the ground, must be implemented on the
8 ground and must actually control the
9 competing vegetation on the ground."

10 So just to use that -- to stress the
11 importance of aerial application, strategically it does
12 not matter which method you use, but it has to be
13 implemental and on the scale we are operating on the,
14 amount of area being renewed in the boreal forest,
15 aerial application I believe is the option of choice in
16 most cases.

17 This focus of -- at the forest level
18 again is important within the timber management plan to
19 give that long-term strategic view and within the
20 five-year review the tactics to achieve that strategic
21 target.

22 Q. So do you have to engage in this kind
23 of thinking when you develop and write a timber
24 management plan?

25 A. Definitely. That would occur in the

1 setting of the objectives for that unit of the
2 anticipated wood supply, and that means that the also
3 anticipated maintenance to keep that wood supply
4 growing is expected at that time.

5 The next overhead just to show trends,
6 trends that have been occurring, and Mr. Hynard showed
7 this in a pie chart form, and this is just for
8 herbicides used for chemical cleaning in Ontario and it
9 is noted that as increased knowledge in technology
10 occurs the interest is increasing.

11 As Mr. Campbell stated, the availability
12 of glyphosate in '84 also shows up in these treatments.
13 It allowed treatment on sites that were not -- could
14 not be done before effectively. So this graph just
15 shows the hectares tended by year by chemical cleaning
16 method. It includes aerial and ground in this
17 situation.

18 It is also currently levelling off as
19 there has been a bit of catch-up of the backup --
20 backlog that occurred on those sites. The very
21 productive sites where 2,4-D, for instance, could not
22 control any grasses and raspberry.

23 The final message and overhead. Cleaning
24 occurs only where - and it is inherent in that whole
25 decision process I described - where the forest

1 management at the unit level objectives require it and
2 at the site level require it, and there is a sufficient
3 crop of healthy trees that have occurred through the
4 renewal program and the competition is or may affect
5 the crop, and that is where the cleaning projects
6 occur.

7 In Ontario that's about approximately
8 one-third of the sites, of the total harvested, and a
9 very minimal amount of those would be actually cleaned
10 each year depending on need.

11 Q. I understand that Dr. Campbell will
12 be giving that kind of information in a little more
13 detail?

14 A. That's correct.

15 THE CHAIRMAN: Mr. Galloway, would you
16 consider tending activities, including spraying
17 activities, in any areas that you would not in the
18 foreseeable future be harvesting?

19 In other words, there is vast areas of
20 the province that you probably have a reasonable idea
21 you are not going to get to at least in the near term
22 or the next ten years or something like that, would you
23 be considering any kind of tending activities to
24 preserve those forests, notwithstanding that there is
25 no harvesting objective within the foreseeable future?

1 MR. GALLOWAY: No. In this tending and
2 cleaning it will only occur where harvest had occurred
3 and where the ensuing renewal had occurred, and on that
4 small part of the land base in any one year is the only
5 place where the cleaning will occur.

6 THE CHAIRMAN: So in an area that, say,
7 had been burned out by a fire but you weren't really
8 going to be harvesting in that area, it was naturally
9 regenerated and it may be coming in in a fashion that
10 is prone to competition, if you are not going to
11 harvest it, you are not concerned about in that sense;
12 is that correct?

13 MR. GALLOWAY: Now, that's a different
14 question. In that sense where you would be -- in most
15 cases after fire, the regeneration coming back would be
16 preferred anyway and it would be rare - I have never
17 known it to happen - but there is some reason that if
18 in fact you wanted to effect that site of a fire, it
19 might be done. But I have never, never heard of it.

20 THE CHAIRMAN: Okay.

21 MS. MURPHY: That question though will be
22 addressed in a little more detail with respect to the
23 insecticide matter, of course, Mr. Chairman; that is,
24 by Mr. Churcher.

25 THE CHAIRMAN: Okay. Is this a good time

1 for a break?

2 MS. MURPHY: Yes, I think, unless you had
3 any questions. Thank you.

4 THE CHAIRMAN: Okay. 20 minutes.

5 ---Recess taken at 3:03 p.m.

6 ---On resuming at 3:45 p.m.

7 THE CHAIRMAN: Thank you. I apologize
8 for being delayed coming in. Does anyone have an extra
9 pen, by any chance?

10 MS. CRONK: Kate?

11 MS. MURPHY: (handed)

12 THE CHAIRMAN: Thanks.

13 MS. MURPHY: Just before we carry on, a
14 couple of the witnesses were concerned about some of
15 the questions from the bench -- from the Board and
16 would like to clarify, if possible, that they were
17 actually responsive to the question and perhaps it is
18 best to have them just explain to you.

19 MR. GALLOWAY: Mr. Chairman, you asked me
20 about: Would you apply herbicides to an area that had
21 not been harvested or planned to harvest, if that's
22 correct, and I said no.

23 And then you said: Well, in case of a
24 fire, renewing the area, might you? And, yes, in fact
25 you might at that time. If it required it, you would

1 evaluate through the same decision chart.

2 Is that a suitable answer?

3 THE CHAIRMAN: Yes, yes.

4 MR. GALLOWAY: Okay.

5 DR. CAMPBELL: Mr. Martel, you asked --
6 you were talking about a situation in Kapuskasing and
7 there was reference to the large trees, and I am a
8 little confused. Could you perhaps describe the exact
9 situation because I am not sure whether I...

10 MR. MARTEL: Well, we were in what was
11 the lowlands which isn't much different from the
12 highland up there, as I learned.

13 DR. CAMPBELL: No, it's not. Three feet.

14 MR. MARTEL: About a foot. And there
15 were these huge types of poplar that were all dead,
16 they can't be used, and they had -- someone said in
17 fact that those were there and dead because they had
18 sprayed.

19 And I wasn't sure if spraying would kill
20 trees that size or the volume it would take, so that's
21 why I asked the question, because they were huge, I
22 mean they were 40, 50 feet high, they were not little
23 trees and the landscape was just filled with them.

24 DR. CAMPBELL: But your reference then
25 was to residuals. Now, were you --

1 MR. MARTEL: Oh, after that. There are
2 certain residuals -- if you are going to go in, there
3 are other trees. I wasn't talking about that type
4 though. When you are applying herbicide, how do you
5 prevent certain trees from not being affected which
6 might have been left for seed or so on?

7 DR. CAMPBELL: Do you mean the crop trees
8 then?

9 MR. MARTEL: Yes. Does that occur or am
10 I just...

11 DR. CAMPBELL: Well, under the conditions
12 that we use the herbicide, the crop trees would not be
13 damaged. And as I said, that even if you had large --
14 were trying to control large trees, you would still
15 only be using a relatively small amount of chemical.

16 In the case of the Vision or glyphosate
17 it is six litres per hectare is the maximum amount that
18 could be used whether or not the trees you are trying
19 to control are large or small. Have we covered it now?

20 MR. MARTEL: I guess what I can't fathom
21 is if you leave certain trees for seed trees and you go
22 back -- can you go back and treat an area -- let's say,
23 you have left seed trees and they are scattered
24 throughout the clearcut, and if you want to treat that
25 area, how could you treat that area without affecting

1 the seed trees that are left?

2 DR. CAMPBELL: If you are talking about
3 deciduous seed trees such as an aspen and you wanted to
4 control, say, grass and raspberries and wanted do it
5 with an aerial application, you couldn't.

6 If by seed trees you mean conifers, which
7 is I think the main sense we normally use seed trees,
8 again, we are pointing out that the conifers have a
9 considerable physiological tolerance and, again,
10 whether they were large or small would not, you know,
11 make that much difference. They will tolerate, say,
12 glyphosate or 2,4-D.

13 MR. MARTEL: That's fine. Thank you.

14 MS. MURPHY: Thank you.

15 Okay. We are going to now go on to the
16 evidence of Cindy Krishka. Again I would like to --
17 oh, that's correct. Excuse me, I have made an error.
18 Mr. Campbell has the end of his evidence to present
19 before Ms. Krishka begins.

20 CONTINUED DIRECT EXAMINATION BY MR. FREIDIN:

21 Q. Mr. Campbell, if you could refer back
22 to 619 which were your overheads. The third topic that
23 you indicated that you were going to cover was Ontario
24 forestry herbicide use.

25 And perhaps you could begin there and

1 provide the Board with the statistics that you
2 indicated were going to be spoken to?

3 DR. CAMPBELL: A. Yes, thank you. Can
4 someone move that projector? Thank you.

5 Okay. Could I ask the people to take
6 their Volume I, Panel 12 and turn to page 228.

7 Tables 2 through 6 here describe the
8 areas treated with the various herbicides used in
9 forestry and they simply compiled the statistics in
10 several different ways. I am not going to go through
11 these in detail, we are just going to look briefly at
12 two of them.

13 If we take the one on page 228, Table 2,
14 the use of herbicides in forestry in Ontario in
15 1986-87, area treated with each herbicide, site
16 preparation versus tending. The first thing you might
17 notice is that 2,4-D and glyphosate, looking in the far
18 right-hand column, actually make up 90 per cent of the
19 total herbicide which is used.

20 Another point to notice, down at the
21 bottom -- the very bottom row along the bottom, per
22 cent, that the breakdown between site preparation and
23 tending, you see that -- at that time anyway, 83 per
24 cent of the herbicide use was for tending and 17 per
25 cent was for site preparation.

1 I should point out here in this series of
2 tables that these figures are for all herbicide
3 applications on Crown land and also on land managed by
4 the Ministry, so it does include a considerable amount
5 of area outside the area of the undertaking.

6 Now, there has been some confusion about
7 the information in Table 1 on page 118 that Mr. Hynard
8 had in his evidence, some confusion why the numbers
9 appear to be different. The point is that the numbers
10 on page 118 are strictly for Crown land in the area of
11 the undertaking. So the different -- the numbers come
12 out slightly different.

13 The other point, on Table 2 here, as we
14 pointed out, there were five herbicides that we are
15 using operationally in the area of the undertaking,
16 2,4-D, glyphosate, hexazinone, simazine and picloram.
17 We have another category here, other herbicides.

18 The other herbicides were used almost
19 exclusively outside the area of the undertaking. In
20 fact, there was only 148 hectares treated within the
21 area of the undertaking in other herbicides than these
22 ones.

23 If we could turn now to Table 4 on page
24 231, this is area treated with each herbicide, aerial
25 versus ground. And the point to make here is that

1 aerial application makes up 87 per cent of the total
2 herbicide application versus 13 per cent on ground.

3 Now, if we look at 2,4-D alone, and this
4 is a herbicide which is used almost solely on cut-over
5 situations as opposed to glyphosate which is also used
6 in an old field situation, we find that 2,4-D, the
7 breakdown actually comes down to 98 per cent aerial
8 versus 2 per cent ground. And that's simply a
9 reflection of the factors that Mr. Galloway referred
10 to, the accessibility, the terrain, the need to cover
11 the area.

12 To move on to the next section which will
13 be herbicide use in perspective. I have included this
14 section because we know that the public is concerned
15 about the use of herbicides in forestry and I believe
16 that at least some of this concern is based on a couple
17 of misconceptions. And the first of these is that
18 different herbicides are used for forest management and
19 for other uses.

20 I think the point to be made here is that
21 all of the herbicides that we are using are ones which
22 are also used in agriculture. There is a reason --
23 there is a very good reason for that actually because
24 what happens is that the forestry market is not really
25 large enough to warrant manufacturing a herbicide

1 strictly for that market, and so we essentially have to
2 ride piggyback on agricultural herbicides.

3 The second misconception --

4 THE CHAIRMAN: Excuse me, Dr. Campbell.

5 DR. CAMPBELL: I am sorry?

6 THE CHAIRMAN: Where else would
7 herbicides be used other than for agriculture or
8 forestry?

9 DR. CAMPBELL: Homeowner use, killing
10 weeds in your lawn.

11 THE CHAIRMAN: Wouldn't that double
12 though for agriculture?

13 DR. CAMPBELL: Pardon?

14 THE CHAIRMAN: Wouldn't the same ones you
15 would use for your lawn also be used in agriculture?

16 DR. CAMPBELL: Oh, certainly. Certainly.
17 But, again, you are probably not going to register and
18 develop a chemical strictly for a homeowner market.

19 The rule of thumb that is often used when
20 coming up with a new herbicide is, if it can't be
21 used -- it isn't going to have a use on corn, soy beans
22 or small grains, forget it. If you can get other
23 crops, that's fine, but you have to have one of those
24 crops probably to really warrant it, as a general rule.

25 The second misconception is that --

1 relates to the significance of the amount of herbicide
2 used in forestry. As we mentioned earlier, we saw from
3 the table, the total amount of herbicide used in
4 forestry in the province was 73,338 hectares. This
5 sounds like quite a lot, but what does it mean? So the
6 rest of my presentation is going to show how this
7 73,338 hectares relates to the forest area being
8 managed and how it also relates to other herbicide
9 uses.

10 This is a herbicide -- this is an
11 overhead entitled: Herbicide Statistics for Crown Land
12 Treated for Forest Management in Thunder Bay District
13 in 1986-87, Part 1. This table and the next two come
14 from Table 7 on page 234 of the statement of the
15 evidence. These tables examine some aspects of the
16 1986 herbicide program in a single Ministry district,
17 the one that we are in right now, Thunder Bay.

18 We see that in 1986 the area within the
19 district which was treated with herbicide was 6,717
20 hectares. And what this represents, this represents
21 0.24 per cent of the total area of the district which
22 is 2.8-million hectares or it represents 0.45 per cent
23 of the area of production forest, 1.5-million hectares.

24 I should just mention in passing that
25 this proportion of the production forest treated is

1 4.45 per cent, is actually -- approximately double the
2 provincial average. So Thunder Bay District is
3 actually a little high in relation to the average.

4 Just trying to again put it in some kind
5 of perspective, the area which was treated with
6 herbicide, the 6,700 hectares, is approximately one
7 quarter of the harvest cut for that year, 28,000
8 hectares. It works out to approximately a third of the
9 size of an average trapline in a district.

10 Now, that would be -- conceivably you
11 could spray a third of a trapline if in fact that 6,700
12 hectares were all in one spot. What we will see is
13 that it is -- in fact it's not.

14 MR. FREIDIN: Q. Do you know how large
15 the average trapline is?

16 DR. CAMPBELL: A. Yes. The average trap
17 line is 17,000 hectares.

18 Q. Sorry.

19 A. So having established that the area
20 treated with herbicides is a small percentage of the
21 production forest, the next question is: How are these
22 6,700 hectares distributed? Is it all in one chunk or
23 is it scattered around in smaller pieces?

24 And for the purposes of this I decided to
25 consider only the area treated aurally, and the reason

1 for this is that the aerial spray blocks tend to be
2 larger and if we included the ground spray blocks in
3 with the aerial ones the average which we would get
4 would probably not be fairly typical or representative.

5 So all this overhead shows on the Thunder
6 Bay District, Part 2, is that the area treated aurally
7 is 89 per cent of the total treated. So if we simply
8 look at the area treated aurally we are considering
9 most of it.

10 The next overhead is the statistics, Part
11 3, and the first item here is the size of a base map
12 and a base map is simply a grid system which is used to
13 locate fires and often silvicultural projects, such as
14 herbicide treatments.

15 You will see that the size of a base map
16 is 25,000 hectares. It would take 114 of these to
17 cover the district and when we check the location of
18 where the herbicide spraying was done in 1986, we find
19 that only 20 of those 114 base maps had herbicide
20 application in them.

21 In a base map in which there was
22 herbicide applied, the average area treated was 299
23 hectares and this works out to 1.2 per cent of the area
24 of the base map.

25 If we refer that back to a trap line, as

1 you recall the trap line was about 17,000 hectares
2 which is somewhat less than the size of the base map,
3 that 299 hectares works out to less than 2 per cent of
4 the area of a trap line. So it's very unlikely that
5 more than 2 per cent of a trap line would be treated in
6 any one year. So this gives us some idea of the
7 spacial distribution of herbicide application across a
8 district.

9 The data in the next three tables comes
10 from Table 8 which is on page 237 of the statement of
11 evidence, and the title of this one: Ontario Herbicide
12 Statistics Forestry versus Other Users, Part 1. And
13 what these do is compare forestry use of herbicides to
14 other herbicide uses in Ontario. If you have a copy of
15 your -- an overhead there, you should note that this
16 total forestry herbicide use, 1986 should be 73,338
17 rather than 346.

18 What we see is that this forestry --
19 total forestry herbicide use, 73,338 hectares,
20 represents 0.21 per cent of the total production forest
21 in the province and the total production forest being
22 35-million hectares.

23 Now, next to this line, this line here,
24 when I compare, taken the 2,4-D and glyphosate use in
25 forestry. And the reason I have taken those two

1 herbicides is because, as we pointed out, they made up
2 90 per cent of the total which was used, in this case
3 66,348 hectares.

4 We have compared them with the
5 agricultural use of phenoxy herbicides and glyphosate.
6 Now, I picked phenoxy because 2,4-D is a phenoxy
7 herbicide, it's the only phenoxy herbicide that we use
8 but agriculture uses a number of other ones, so it
9 makes sense to compare. We are in effect comparing
10 forestry use of phenoxys and glyphosate with
11 agricultural use of phenoxys and glyphosate.

12 Unfortunately, the most recent figures I
13 was able to get for agriculture was 1983, it probably
14 has not changed dramatically. I used the 1986 figures
15 for forestry because they are probably more
16 representative of what we are using now. In 1983
17 glyphosate was not available for operational use.

18 What we find then is that the
19 agricultural use of these two herbicides or these two
20 categories, in the agriculture use we have 500,000
21 hectares versus 66,000 in forestry. There is seven
22 times as much used in agriculture as in forestry.

23 If you work it out on a percentage basis,
24 there is a much smaller agricultural crop area than
25 there is production forest, so the per cent of

1 agricultural crop area treated with these herbicides
2 works out to 12 per cent as opposed to .21 per cent in
3 forestry, a 60 times differences.

4 Q. On that particular overhead, forest
5 herbicide use 1986, which is the third line, were all
6 five of the herbicides that are used in forestry
7 included in that number?

8 A. Yes, this includes all five of the
9 herbicides.

10 Q. Right. And if we look at the second
11 last line for agriculture, phenoxy and glyphosate, are
12 those the only two herbicides which are only used for
13 agricultural purposes?

14 A. No. There is a large number of other
15 herbicides used in agriculture and, just as an example
16 from the same source I checked, for example -- there
17 is -- 1,052,000 hectares of corn were grown in 1983 in
18 Ontario and of that, when you add it up, the various
19 herbicides which were used on that corn, it came to
20 1.7-million hectares.

21 Now, obviously a lot of the hectares were
22 treated with more than one herbicide or treated more
23 than once in that one year.

24 THE CHAIRMAN: Dr. Campbell, what are
25 they using in substitution for alachlor these days, is

1 it one of the ones you use in forestry that also would
2 suit that?

3 DR. CAMPBELL: No. The one which would
4 probably be the major one is a related -- there is
5 alachlor and there was also something called
6 metolachlor. It's a similar chemical and I would
7 suspect when we get the statistics out - they collect
8 these agricultural statistics every five years, so they
9 should have done it in 1988 too and I would expect the
10 report will be out shortly - and I think what you would
11 find is that where alachlor -- just hang on a second...

12 In 1983 there were -- 233,000 hectares
13 were treated with alachlor and 211,000 were treated
14 with metolachlor. The basis for the difference - I'm
15 choosing one over the other - I am not sure about.
16 Certainly the experts in agriculture argue back and
17 forth a bit, but I think what you would find is that
18 that entire 450,000 hectares would probably be almost
19 entirely metolachlor.

20 MR. FREIDIN: Q. And if we take -- you
21 indicated that more than just the phenoxy and
22 glyphosate are used in agricultural purposes. If we
23 added in all of the agricultural herbicides and
24 compared those to all of the forestry herbicides, what
25 would happen to the numbers that we looked at?

1 DR. CAMPBELL: A. Well, the numbers
2 would obviously get very large. As I say, it's
3 difficult to do it on the basis of hectares because a
4 lot of the areas are treated with more than one
5 herbicide.

6 This is why I simply took corn. It's one
7 of the - it and soya beans are the two largest crops.
8 But as I say, even with simply taking corn which
9 represents only a quarter of the agricultural land, it
10 was 1.7-million hectares worth of herbicide
11 applications on that.

12 Q. Right. So you said the numbers would
13 get larger. I assume you are talking about the
14 differences between the numbers?

15 A. That's correct. This next overhead
16 Forestry versus Other Users, Part 2 and what it is
17 simply doing is comparing the forestry use of 2,4-D
18 with some other non-agricultural uses.

19 And in this particular slide we talk
20 about utility rights-of-way, this is going to be hydro
21 and the pipelines primarily; road sides I think is self
22 explanatory; commercial lawn care, 2,4-D use, this is
23 people such as Chemlawn and the Weedman who come around
24 and will spray lawns or things like golf courses
25 perhaps.

1 We have a slight mixed set of statistics
2 here. I couldn't get all of the figures for 1986, so
3 it is somewhere from 1983. The roadside is all
4 phenoxys rather than just 2,4-D, but in terms of
5 ballpark figures, what we can see here is that the
6 forestry herbicide use in 1986 of 2,4-D; 35,000
7 hectares, is approximately one third of the total
8 non-agricultural use, the total being 110,000 hectares.

9 And the next overhead: Forestry versus
10 Other Users, Part 3. What we are comparing here is the
11 use of 2,4-D by householders and by -- and for
12 forestry.

13 Now, the figure for householders is
14 expressed in terms of kilograms purchased because it's
15 possible to obtain records of the amount that was sold;
16 it's not possible to get a record of actually what area
17 was treated by the householders.

18 This figure came from a report --
19 consulting report which is listed in my bibliography,
20 the Deloitte Report and they actually had sales figures
21 for all of these different use patterns.

22 They listed the sales of 2,4-D to
23 forestry and the number they came up with was a very
24 small one which gave somewhat of a misleading
25 impression because it certainly didn't represent what

1 we had used. I estimated the amount of 2,4-D which was
2 used in terms of kilograms from the amount of area that
3 was treated, and I think the -- well, the reason that
4 the figures they had were low was that obviously the
5 2,4-D we used in 1986 had been purchased previously.

6 Q. You made reference to a report and
7 I'm sorry, I didn't catch that. Was that the Deloitte,
8 Haskins Report?

9 A. That's correct.

10 Q. Thank you.

11 A. The point here anyway is that
12 householders in Ontario actually purchased, whether
13 they used it or not, purchased more 2,4-D than was used
14 in forestry in 1986.

15 The last overhead just summarizing
16 herbicide use in perspective and just the points to be
17 made here is that the area of forest treated is small --
18 treated with herbicides is small in comparison to total
19 forest area. The area of forest treated with herbicide
20 is composed of small blocks which are widely separated
21 and the area treated for forestry purposes is small in
22 comparison to the area treated for other uses.

23 And that is my evidence.

24 MR. FREIDIN: Thank you, Dr. Campbell.

25 MS. MURPHY: I would like to file some

1 material as exhibits and, again, I would like to file
2 all of the exhibits before Ms. Krishka starts so that
3 we don't have to interrupt as she goes through.

4 THE CHAIRMAN: Very well.

5 MS. MURPHY: The first one is a series of
6 overheads. And again for the exhibit I have marked the
7 pages in this case A to G and that will be 623; will
8 it, Mr. Chairman?

9 THE CHAIRMAN: That's correct, Exhibit
10 623.

11 MS. MURPHY: (handed)

12 THE CHAIRMAN: Thank you.

13 ---EXHIBIT NO. 623: Series of overheads (A to G) to be
14 used in Ms. Krishka's
evidence-in-chief.

15 MS. MURPHY: The next exhibit is an
16 envelope that contains hard copies of the photographs
17 that Ms. Krishka will be referring to and she has also
18 prepared, and I would suggest that we file separately,
19 a list of those slides.

20 It does contain some material that was
21 not in the witness statement, but on this list she has
22 indicated which the new ones are, has provided the
23 description of them, and has indicated for the ones
24 that were in the material, what photograph number they
25 were originally.

1 THE CHAIRMAN: Okay. Let's mark the hard
2 copies of the photographs Exhibit 624, the list of the
3 slides Exhibit 625.

4 MS. MURPHY: (handed)

5 THE CHAIRMAN: Thank you.

6 ---EXHIBIT NO. 624: Hard copies of photographs to be
7 used by Ms. Krishka in
evidence-in-chief.

8 ---EXHIBIT NO. 625: List of slides to be used by Ms.
9 Krishka in evidence-in-chief.

10 MS. MURPHY: Next we have two
11 interrogatories. I would suggest that we file them
12 separately since Ms. Krishka will be speaking to one of
13 them. So first, interrogatory from the Ministry of the
14 Environment to Panel 12, Question No. 12.

15 THE CHAIRMAN: Exhibit 626.

16 ---EXHIBIT NO. 626: MOE Interrogatory Question No. 12
17 (Panel 12).

18 MS. MURPHY: And the second one is an
19 interrogatory from Forests for Tomorrow to Panel 12,
20 Question No. 11.

21 THE CHAIRMAN: Exhibit 627.

22 MS. MURPHY: (handed)

23 ---EXHIBIT NO. 627: FFT Interrogatory Question No. 11
24 (Panel 12).

25 MS. MURPHY: And finally in her evidence

1 Ms. Krishka will be referring to two studies that were
2 actually conducted by her and others.

3 She will -- in the evidence she will only
4 be referring to a couple of graphs or charts that are
5 in these studies but we thought it would be wise to
6 provide the studies as exhibits and to the other
7 parties.

8 So the first one is called Spruce Height
9 and Volume Growth, Response to an Aerial Release
10 Treatment Using 2,4-D on Three Plantations Near
11 Manitouwadage, Ontario by Krishka and Towill,
12 T-o-w-i-l-l, and that is dated I believe 1989.

13 THE CHAIRMAN: Exhibit 628.

14 ---EXHIBIT NO. 628: Study entitled: Spruce Height and
15 Volume Growth, Response to an
16 Aerial Release Treatment Using
17 2,4-D on Three Plantations Near
Manitouwadge, Ontario by Krishka
and Towill dated 1989.

18 MS. MURPHY: And second one is called:
19 Jack Pine Height and Volume Growth, Response to an
20 Aerial Release Treatment Using 2,4-D on a Plantation
21 Near Atikokan, Ontario, again by Krishka and Towill and
22 again dated 1989.

23 THE CHAIRMAN: Exhibit 629.

24 ---EXHIBIT NO. 629: Study entitled: Jack Pine Height
25 and Volume Growth, Response to an
Aerial Release Treatment Using

1 2,4-D on a Plantation Near
2 Atikokan, Ontario, by Krishka and
 Towill dated 1989.

3 MS. MURPHY: (handed)

4 THE CHAIRMAN: Thank you.

5 MS. MURPHY: And just before we start,
6 did you have a preference as to a time to rise, Mr.
7 Chairman?

8 THE CHAIRMAN: Well, where do you think
9 you will be?

10 MS. MURPHY: Well, actually I have a lot
11 of hope that we would actually finish Ms. Krishka in
12 perhaps an hour and a half or less, and perhaps we
13 should just try to do that.

14 However, of course, if you had some other
15 plans I thought it would be wise for us to find out.

16 THE CHAIRMAN: An hour and a half would
17 take us close to six. How much have you got left for
18 tomorrow and the next day?

19 MS. MURPHY: Well, Mr. Buss won't take
20 very long. I am not sure about Mr. Churcher, and I was
21 planning to do Mr. Nicholson and Mr. Iskra together on
22 Thursday. As you know, Mr. Nicholson will be here
23 Thursday and they would be finished Thursday.

24 THE CHAIRMAN: Well, I guess the question
25 is: How far are you going to get tomorrow?

1 MS. MURPHY: Well, actually things are
2 looking fairly positive. I would expect Mr. Buss at
3 the most would be an hour or less and Mr. Freidin says
4 that Mr. Churcher might be two and a half hours and
5 those are the only two witnesses to deal with tomorrow.

6 THE CHAIRMAN: So if we spill over with
7 Ms. Krishka tomorrow that won't be a major problem?

8 MS. MURPHY: That sounds like that's
9 true.

10 THE CHAIRMAN: Mrs. Cronk?

11 MS. CRONK: Thank you, Mr. Chairman. As
12 the matters come up, perhaps I could raise a scheduling
13 difficulty that has arisen for me on Thursday.

14 I have spoken to Ms. Murphy and Mr.
15 Freidin in advance of the commencement of this evidence
16 to determine how long they expected to be in
17 examination-in-chief.

18 The difficulty is, is that I am required
19 to be in Toronto early Thursday afternoon for a matter
20 which is impossible to reschedule; that is, being quite
21 candid I can't move it, but I have been -- was assured
22 from the outset and repeatedly by Ms. Murphy and Mr.
23 Freidin that they would be fortunate to get all the
24 evidence in in-chief, in any event, by the end of the
25 day Thursday and I know that Mr. Nicholson was

1 scheduled for Thursday morning in any event.

2 So I point the matter out to you only for
3 the purpose of asking for I hope what will be a minor
4 indulgence that may never arise and; that is, that if
5 all of the witnesses were to be finished at some point
6 Thursday morning when, in the normal course, you would
7 turn to our side of the table and ask us to begin
8 cross-examination - it would be, I suspect, no more
9 than a matter of an hour or so on Thursday - I would
10 ask for your indulgence in either setting that
11 cross-examination down or, in these circumstances,
12 calling someone else first for that limited purpose.

13 But I am hopeful that matter will not
14 arise at all, given the scheduling that my friends
15 have, but as it has come up, sir, I thought it best
16 that I raise the matter now with the Board.

17 THE CHAIRMAN: Okay. Thank you, Ms.
18 Cronk.

19 I think the Board will in fact indicate
20 now that we would not start cross-examination until the
21 following week.

22 MS. CRONK: Thank you very much.

23 THE CHAIRMAN: So wherever you finish on
24 Thursday we will finish for the week. I think we are
25 doing well (a) in having combined both panels and, (b)

1 in finishing all of the direct with this whole panel in
2 the time we had this week.

3 MS. CRONK: Thank you very much, Mr.
4 Chairman.

5 MS. MURPHY: Thank you. Mr. Chairman.

6 THE CHAIRMAN: So I think in answer to
7 your first question, we might as well go perhaps
8 another hour, and then I don't think there will be any
9 problem starting at nine tomorrow for you finishing off
10 at a reasonable hour tomorrow with all of the
11 witnesses, except the two on Thursday.

12 MS. MURPHY: All right.

13 CONTINUED DIRECT EXAMINATION BY MS. MURPHY:

14 Q. Ms. Krishka in speaking to Document
15 No. 4 which commences at page 245 of the witness
16 statement for Panel 12, and the name of that report is:
17 Effectiveness of Cleaning and Effects of Tending on the
18 Forest Estate. Is that correct, Ms. Krishka?

19 MS. KRISHKA: A. Yes, it is.

20 Q. And would you explain how you have
21 gone about developing your evidence and basically what
22 it is going to be about?

23 A. Yes. I will be presenting my
24 evidence basically in two parts. The first part will
25 deal with the effectiveness of cleaning by manual and

1 chemical cleaning treatments.

2 Q. And we are going to ask you to move
3 the microphone because that will only pick up your
4 voice if you are right in front of it.

5 A. Is that it? Is this better?

6 Q. Yes.

7 A. I will be dealing with the
8 effectiveness of cleaning by manual or chemical
9 cleaning treatments primarily with conifers.

10 I will be addressing basically two
11 questions in this part, the first one being: How do
12 you measure or assess the effectiveness of cleaning
13 treatments; the second question being: Are cleaning
14 treatments effective.

15 The second part of my evidence will deal
16 with the effects of tending by all treatments; that is,
17 all types of tending treatments on the forest estate.
18 And the basic question here will be: Will tending
19 affect the forest estate in different ways than would
20 harvest or site preparation.

21 And as did the previous witnesses, I will
22 try to focus my evidence primarily on issues and
23 questions that have been raised and not spend too much
24 time on the written evidence.

25 THE CHAIRMAN: Thank you.

1 MS. KRISHKA: You have heard, or rather
2 in the statement of evidence there is a description of
3 what cleaning treatments are in Peter Hynard's
4 statement of evidence. Rob Galloway has described what
5 the purpose of the cleaning treatments are and briefly
6 I will say that's again to temporarily suppress
7 vegetation which competes for light, moisture,
8 nutrients and space.

9 My focus will be on the objectives of
10 cleaning treatments. The objectives are basically
11 twofold: The first being to enhance survival and to
12 attain free to grow and; secondly, to increase the
13 long-term growth and yield. The question here is
14 basically: Does it work?

15 MS. MURPHY: Q. So just before you carry
16 on, Ms. Krishka, there were two objectives that you
17 were referring to. The first one is to enhance
18 survival and attainment of free to grow?

19 MS. KRISHKA: A. That's correct.

20 Q. And the second one was...?

21 A. The second one was to increase
22 long-term growth and yield. As I said, the basic
23 question here is: Does cleaning work?

24 There is some general interest in whether
25 the expenditure of time and money is justified for

1 cleaning treatments. People have been examining this
2 question and attempting to quantify the benefit of
3 cleaning treatments.

4 This type of research and examination
5 will help to answer questions about long-term wood
6 supply in a quantitative way and I think the Board has
7 heard about how that would be useful in Panel 4 in
8 terms of wood supply.

9 Can I have the next overhead, please.
10 Effectiveness can be measured two ways. You can
11 measure direct effects and you can measure indirect
12 effects.

13 Direct effects basically look at the
14 efficacy or the efficaciousness of a treatment. The
15 first way -- there are two different things you would
16 look at in terms of direct effects. You would look at
17 vegetation control and that would be: Have you
18 controlled the target vegetation. The second thing you
19 can look at is crop tolerance, you have heard of this
20 from Dr. Campbell, the question being, or the point
21 being: Have the crop trees been damaged.

22 Indirect effects are effects that look at
23 effectiveness. In this case you are specifically
24 looking at crop response. The question is: Have you
25 met your cleaning objectives, your objectives again

1 being, to increase survival and/or increase growth.

2 This kind of assessment applies to all types of
3 cleaning treatments whether they be manual or chemical.

4 Direct effects are relatively simple to
5 determine. For herbicides, manufacturers must prove
6 efficacy in order to get registration and they
7 determine a range of rates that can be applied.

8 However, further work is done in this area by users to
9 look at -- to test specific seasons and rates to find
10 what is the most efficient use under various
11 circumstances; that is, they would undertake studies or
12 attempt to look at operational treatments to refine the
13 optimum limits within the range that is on the label.

14 For manual treatments, it's really
15 simple, you just go and look at it. If the
16 prescription on a manual tending treatment was to cut
17 or to remove a certain number of stems on a site, after
18 the treatment you would go out and look and see if you
19 had reached your management objective. So these direct
20 effects are generally visible in a short period of time
21 after the treatment.

22 Indirect effects are a little bit more
23 complicated. This is where a great deal of research is
24 being done, the large majority of research is being
25 done, and that is the area that I will mainly be

1 addressing.

2 Effectiveness of cleaning treatments are
3 generally measured two ways. You can either measure
4 them by examining the results of scientific documented
5 studies or you can use experience gained from field
6 observation and monitoring. When we look or examine
7 effectiveness, we are looking at it in terms of
8 providing better survival and/or increased growth and
9 yield for crop trees.

10 Q. I understand that for the purposes of
11 preparing your evidence and for the purposes of writing
12 this evidence you did look at results of scientific
13 studies?

14 A. Yes, we did.

15 Q. Okay. Can you explain how you went
16 about that and basically what your conclusions were?

17 A. For the purpose of this EA we
18 undertook a review of scientific studies reporting
19 conifer response to cleaning treatment; that was
20 cleaning treatments of any type, whether they be manual
21 or chemical.

22 I am generally familiar with the subject
23 area and the literature available since I have done
24 these type of studies myself and we have submitted a
25 couple of papers that I have been involved in

1 preparing.

2 We did a literature review and
3 documented -- which documented conifer response by
4 cleaning treatments of any type. We specifically
5 looked at conifer in this case because in the area of
6 the undertaking the majority of cleaning treatments are
7 done on conifer plantations and, as a result of that,
8 most of the research that's been done has been on
9 conifers.

10 I will just take a few minutes to explain
11 how we went about doing the literature review. First,
12 we conducted a search of various databases for studies
13 that reported conifer response to cleaning by any
14 means. The search included information on areas
15 outside of the area of the undertaking. This was a
16 question that was raised in an interrogatory from the
17 OFIA. They had asked if the studies that we reported
18 were restricted to Ontario.

19 What we did is we put the emphasis of the
20 lit review on similar species, sites and climatic
21 conditions to the area of undertaking. There are some
22 studies in the literature review that are from outside.
23 The reason we did this is if -- there is an equal
24 amount, if not more, data available on conifer response
25 to cleaning treatments in other areas, but these areas

1 are generally not terribly representative of the boreal
2 forest. In fact, in most cases they are faster growing
3 trees, are more productive growing conditions and we
4 felt that the results would not really be
5 representative of what we would see here in the boreal.
6 So, as a result of this review, we located 116 relevant
7 studies.

8 The literature was then reviewed and
9 categorized into three different categories. First,
10 the first category was studies that reported a
11 long-term benefit, that would have been studies where
12 the assessment was conducted more than ten years after
13 the tending treatment.

14 THE CHAIRMAN: Ms. Krishka, if I could
15 ask a question on something you said earlier. You
16 mentioned that the effectiveness in terms of
17 registration of the herbicide was within certain ranges
18 on the label which was the basis for the registration
19 in the first place.

20 Is the effectiveness measured in terms of
21 the herbicide with respect to a particular specie of
22 tree or vegetation; and, if so, does it also indicate
23 in terms of applying a number within that range of
24 effectiveness to anything like site or climatic
25 conditions? In other words, does it differentiate

1 between where the specie or vegetation might be?

2 MS. KRISHKA: Well, yes. In some
3 labels -- well, I will answer the first part of your
4 question, if I can recall it. As I recall, your first
5 question was: Is it -- do they actually look at
6 certain specific vegetations?

7 THE CHAIRMAN: Yes.

8 MS. KRISHKA: And the answer to that is
9 yes, they do. They will look at efficacy on a variety
10 of different species and a label will list specifically
11 which species the herbicide will control and which
12 species it can be used on.

13 THE CHAIRMAN: Is that within the general
14 range or do they even break it down further and say it
15 is more effective on spruce, less effective but within
16 an acceptable range on something else?

17 MS. KRISHKA: Well, it might tell you
18 that it is effective at controlling "x", "y" and "z".
19 It may say that it can affect -- it can be effective in
20 controlling "a" under certain conditions, but your
21 second -- the second part of your question...?

22 THE CHAIRMAN: The second part was: If
23 you are controlling, say, poplar or -- for instance,
24 poplar or aspen or something like that, in terms of the
25 registration, if it is registered in Canada, is that

1 good throughout Canada or would they even go further
2 and say within the boreal forest?

3 MS. KRISHKA: Well, there are examples of
4 where some products are restricted to use in certain
5 parts of Canada.

6 I believe picloram, which is - and, Dr.
7 Campbell, you might be able to help me here - but I
8 believe picloram is registered for use in certain ways
9 in western Canada and in different ways in eastern
10 Canada.

11 DR. CAMPBELL: At the present time the
12 herbicides which we are using in forestry have a
13 Canada-wide registration. The only one that comes to
14 mind is there was one, phosamminammonium which was
15 registered strictly for B.C. for a while.

16 And normally this is simply a reflection
17 of the fact that in order to have a Canada-wide
18 registration the regulatory -- federal regulatory
19 agency, which is Agriculture Canada, will require that
20 there be data generated from across Canada and if data
21 were only generated in B.C., they would probably
22 restrict the registration to that.

23 THE CHAIRMAN: Thank you. And in B.C.
24 would also -- well, the provinces in Canada under their
25 own legislation may piggyback on the federal

1 registration, but it would also have to be registered
2 in the province as well; is that correct?

3 MS. KRISHKA: Shedules.

4 DR. CAMPBELL: Each province has its own
5 rules. What we have of course in Ontario is that
6 things are not registered, rather they are scheduled
7 which depends upon who can use them, and who can use
8 them and who can sell them, and the system in Canada is
9 that the provinces can be more restrictive than the
10 federal system, but they cannot be less so.

11 MS. MURPHY: Q. Do those labels that you
12 are talking about -- Dr. Campbell, maybe we will just
13 continue with you for a second. The labels you were
14 talking about, does it tell you specifically on that
15 label what kinds of uses that product can be used for?

16 DR. CAMPBELL: A. Yes, that is correct.

17 Q. So would it say for forestry use?

18 A. For example, some of the 2,4-D labels
19 which we use might also include use on small grains,
20 use on corn, use on rights-of-way, possibly even turf.

21 Q. And would the label -- when it has on
22 it that this particular product can be used for
23 forestry, will it have on it any further information
24 about the rates that can be used or the time of year
25 that it can be used?

1 A. It will have the rates for each use
2 pattern and they may differ, they may differ quite
3 considerably because -- depending upon the thing.

4 They will certainly in the forestry one,
5 if we talk about 2,4-D - I don't have the label at
6 hand - but the exact wording I think on 2,4-D is: Do
7 not apply for release treatments for conifers until the
8 buds have set and are hard and sharp to the touch,
9 which basically means they have stopped growing, they
10 have set their buds and they are essentially dormant.

11 Q. So it is pretty specific as to the
12 actual treatment too, you pointed out for forestry,
13 for release for conifers?

14 A. Yes. And in fact there would also
15 be a separate section for site preparation. And in
16 fact on the 2,4-D label the rates for site preparation
17 are somewhat higher because you don't need to be
18 concerned about the crop tree tolerance.

19 Q. I see.

20 MR. MARTEL: Did the labeling change
21 after the WHIMIS legislation came in? Was there a
22 change in the labeling of these various products?

23 DR. CAMPBELL: Well, at the present time
24 WHIMIS does not apply to pesticides because what they
25 have essentially decided when they looked through the

1 Pest Control Products Act legislation, the labeling
2 requirements, which is the main aspect of WHIMIS,
3 really is already there. So it would essentially be a
4 duplication. Pesticides have been, you know, much
5 more...

6 MR. MARTEL: Advanced.

7 DR. CAMPBELL: Well, that's right. I
8 mean, in terms of labeling and precautions and
9 antidotes and who to call and all that sort of thing
10 has been on the label for many years.

11 Now, they are going to review it. I
12 believe it is in 1990, they are going to look at it
13 again, depending I suppose how WHIMIS perhaps evolves
14 to see whether, you know, there is any need to add
15 anything.

16 MS. MURPHY: Q. Ms. Krishka, you were
17 about to explain how you took those studies, the 116,
18 and divided them into a number of categories.

19 And you had explained to us that the
20 first category was a list of the studies that reported
21 long-term benefits. Those were studies where the
22 assessments were done more than 10 years after the
23 treatment; is that right?

24 MS. KRISHKA: A. That's right.

25 Q. Okay.

1 A. The second category were reports that
2 looked at short-term benefit and that would be where
3 assessment was conducted less than 10 years after the
4 treatment. And we had a third category which reported
5 nil or negative results.

6 These categories were arbitrarily
7 selected. We used the 10 years basically because we
8 picked that number as generally being considered the
9 early establishment period. Beyond 10 years generally
10 you reach free to grow. So that number was picked
11 completely arbitrarily.

12 And I remind you that these categories
13 were defined only for the purpose of this particular
14 literature review. On the other hand, in the context
15 of determining conifer benefit at time of harvest, when
16 we use the term long-term there, long-term is usually
17 meant to mean at the end of a full rotation. Just keep
18 that in mind.

19 Q. Did you find any studies when you did
20 this review that examined the benefit at the time of
21 harvest?

22 A. No, there aren't any studies looking
23 at that that I am aware of and that's because -- for a
24 pretty good reason, and Peter Hynard alluded to it
25 yesterday when he said that tended stands have not yet

1 completed a full rotation.

2 So we haven't been able to collect any
3 quantified data of that type, partly because the stands
4 aren't old enough yet and also because of a number of
5 other reasons that I will be talking to.

6 Could I have the next overhead, please.

7 THE CHAIRMAN: What was the date, Ms.
8 Krishka, going back to when the first tending was, has
9 it only been in for some 16, 17 years?

10 MS. KRISHKA: Well, use of 2,4-D in
11 forestry goes back about 30 years. There were a number
12 of parameters that were used to evaluate the response
13 in the studies that we looked at.

14 MS. MURPHY: Q. Just before you go on,
15 just so I can maybe clear up that last question. How
16 long would you have to have between the treatment and
17 harvest, would it be 30 years or would it be longer?

18 MS. KRISHKA: A. Well, for conifer the
19 rotation period would be anywhere from 60 to 100 years.

20 The OFIA had a question about parameters
21 used to evaluate crop response in their issues. These
22 are the list of the parameters that were considered in
23 the studies that I looked at.

24 The first paramater that's considered is
25 survival. You recall that's also the first main

1 objective of a cleaning treatment. When you are
2 looking at survival it is very important that you know
3 what the pre-treatment stocking was on the plantation.
4 Without knowing that, it is pretty difficult to go back
5 in afterwards and determine what your survival rate is
6 because you didn't know what you had there before.

7 In this case, you need to have a
8 representative control area and a treatment area. A
9 control area generally would have to be perhaps part of
10 the actual treatment area that was reserved and not
11 treated. It is very important that the control area be
12 the same in every other way to the treated area for it
13 to be representative.

14 And you might remember yesterday when
15 Peter Hynard was showing his slides he showed a photo
16 of -- I believe it was a red pine plantation, and he
17 had mentioned that they know that they have got a
18 pretty good response but they couldn't quantify what
19 the benefit was because he didn't have a control area
20 to treat it to.

21 The second parameter that is very
22 frequently measured is height and height is normally
23 reported in two ways; either total height from the
24 ground to the top of the tree, or annual increment
25 which would be the amount of growth -- height growth

1 that was put on in a single year.

2 The third parameter would be diameter,
3 and this is usually either measured at the root collar,
4 at the base of the tree or at breast height.

5 The fourth parameter is volume. I will
6 be speaking to volume too a little bit more later on.
7 Volume can be measured either per stem; that is,
8 measuring the volume of an individual tree, or on a per
9 area basis. And, in that particular case, you sort of
10 have to take stocking in mind. To determine volume on
11 an area basis, not only do you have to know what the
12 volume is for individual trees, but you have to know
13 how many trees are growing within the area.

14 Again, with volume it is important that
15 you know what the pre-treatment volume growth was so
16 that you know where -- what you started with to compare
17 after the treatment. Volume can vary quite a bit, so
18 if you measure volume after a treatment and you find on
19 one site the volume rate appears to be much greater on
20 one site compared to another, it is important to know
21 if there were those types of differences in volume
22 growth even before the treatment.

23 In other words, the treatment itself
24 might not be the only factor that had a play in that
25 particular response. Again, it is very important in

1 volume studies to have a control area as well as a
2 treated area, a representative control area.

3 The final parameter is dominance or crown
4 position and this is usually expressed in relative
5 terms of the crop tree compared to the competing
6 vegetation and it is usually recorded in three
7 categories:

8 Open growing, and that would be a tree
9 that was growing open without competition around it or
10 above it; intermediate suppression, that would be a
11 tree with some growth perhaps around it or over it, but
12 it still does have some openness; and suppressed trees,
13 that would be a tree that would be completely
14 suppressed by trees growing around and over it.

15 Different studies use different
16 parameters and you have to take this difference into
17 consideration because for a study that looked at one
18 parameter and another study that looked at another
19 parameter may not be directly comparable, but they can
20 be directional. You can start to look at trends, even
21 if you can't directly compare to different studies.

22 It is important when looking at a
23 specific study to note which parameters are being
24 measured because some parameters may reflect growth
25 response better than others. For example, height is

1 the most common parameter that is measured, partly
2 because it is really easy to measure and also because
3 it is a useful parameter to look at.

4 But in the case of jack pine, lateral
5 suppression, trees growing around it, may not reduce
6 the height growth, but often result in a reduction or a
7 slower diameter growth.

8 If you had a jack pine growing on one
9 hand and it was being suppressed, it may be growing at
10 a certain height. You may have another tree close by
11 that is not suppressed, it is growing open, and it may
12 be the same height. And you would look at it and you
13 would say: Well, here is one tree that's growing open
14 and another trees that's growing suppressed and they
15 are the same height. You know, it doesn't seem like
16 the competition has really caused a problem.

17 But if you look a little deeper and you
18 measure the diameter, you will very likely find that
19 the diameter of the suppressed jack pine is much
20 smaller than the diameter of the open growing jack pine
21 and this would be reflected in a much greater volume in
22 the open growing tree and, in fact, I will show you an
23 example of that shortly or tomorrow, depending how far
24 I get.

25 As I said earlier, volume can be measured

1 by stem or by area. In an interrogatory by Forests for
2 Tomorrow they asked for studies showing increased
3 volume by area.

4 MS. MURPHY: And that was the
5 interrogatory we filed, Mr. Chairman, as Exhibit 627
6 and it has attached to it a table.

7 Q. Did you prepare that table, Ms.
8 Krishka?

9 MS. KRISHKA: A. Yes, I did.

10 MS. MURPHY: I think it will help if you
11 will look at that table. Ms. Krishka will be directing
12 your attention to a couple of details.

13 MS. KRISHKA: Forests for Tomorrow had
14 asked us for total yield per hectare and we explained,
15 as I think you have already heard, that you can't
16 measure total yield per hectare until you actually
17 harvest.

18 So what we did is we looked at the
19 studies that we had examined that had reported volume
20 per hectare over various site and study periods, and I
21 put those studies together on this table.

22 So what you have here is a list of
23 different studies that were conducted at different
24 times by different people in different places, but they
25 all report per cent volume change of treatment compared

1 to control on a volume per hectare basis.

2 MS. MURPHY: Q. And was this a review of
3 all 116 of the studies?

4 MS. KRISHKA: A. Yes. If I can direct
5 your attention to the second column from the right, you
6 will see the list of numbers in per cent.

7 If you look down that column you will see
8 a pretty wide range of results. It shows increases in
9 volume anywhere from about 2 per cent to over 600 per
10 cent and there are even a few in there that show
11 decreases in volume or lower volume growth. This gives
12 you some indication of the kind of variation you can
13 have on a site and species basis.

14 THE CHAIRMAN: What is the reason for the
15 decreases; is it maltreatment?

16 MS. KRISHKA: Well, actually I was going
17 to get to that.

18 THE CHAIRMAN: Okay.

19 MS. KRISHKA: Okay, I will get to that.
20 If you look, the studies that reported negative results
21 are primarily in this one particular report that was
22 written by Steniker, 1967. He looked at a variety of
23 white spruce plantations in Manitoba and Saskatchewan.

24 If you look at the third column from the
25 left you will see how old the stand was at the time of

1 treatment and these stands that he was looking at were
2 relatively old. Most of them, as I recall, were
3 natural stands and they are relatively older than what
4 we normally would find that we would clean.

5 One can speculate as to the reasons why a
6 negative result would occur. Most commonly poor
7 response would be a result of the crop trees being
8 suppressed for a significant period of time and their
9 vigor is just very low, and when they find themselves
10 in open condition they are just not prepared to respond
11 to the treatment.

12 MS. MURPHY: Q. Is the concept you are
13 discussing related at all to the concept that Mr.
14 Galloway was talking about earlier when he said you
15 have to assess the health of the crop trees and
16 determine whether treatment is likely to make the
17 situation worse or, in fact, give you enough of a
18 benefit?

19 MS. KRISHKA: A. Yes, exactly. And, in
20 fact, in Mr. Galloway's statement of evidence he spoke
21 about white spruce specifically tending to have this
22 problem. Sometimes when white spruce is suppressed for
23 a long time and then it's released, it is not able to
24 respond, in fact, it may result in some detrimental
25 results.

1 On the other hand, you will notice that
2 in the same study -- at the bottom of the list there is
3 a study that shows over 350 per cent increase in volume
4 and that was, you know, a pretty advanced stand when it
5 was cleaned and, in that particular case, what that
6 shows you is that you are not restricted from having a
7 good response just because the stand is older, you can
8 still have a good response. It really depends on the
9 situation, condition and the vigor of the trees.

10 THE CHAIRMAN: I am just curious -
11 nothing really hinges on it - but why, when you treat
12 something and you free it from some competition, if you
13 haven't killed it by applying the herbicide or retarded
14 its growth, why wouldn't it just respond the same way
15 as if it were untreated?

16 In other words, why would you get a
17 negative response unless you misapplied the treatment
18 in some way? If you just opened up the competition,
19 released it from its competition, why would it not grow
20 at the normal rate?

21 MS. KRISHKA: Well, firstly, if the
22 problem with response or the negative growth was a
23 result of the herbicide, there are a number of ways
24 that you would clearly be able to see and explain. If
25 the effect was because of herbicide damage, you would

1 be able to identify herbicide damage.

2 The reason why --

3 THE CHAIRMAN: I can understand that,
4 that response, but what I am saying is: If there
5 wasn't any herbicide damage--

6 MS. KRISHKA: That's right.

7 THE CHAIRMAN: --and really what you are
8 doing is clearing out some of the competition, why
9 would you end up with a negative response?

10 MS. KRISHKA: Well, it is interesting,
11 and there is a fair bit of work that has been on this
12 and it really has to do with tree physiology.

13 But in the case of jack pine, for
14 example, studies have been done and they have actually
15 been able to identify that the needles, after a certain
16 period of time growing under suppression, adapt to the
17 shade situation.

18 And when they find themselves suddenly in
19 open growth conditions, the needles which have adapted
20 to the shade can't respond, and sometimes the response
21 is delayed because you would have to wait for normal
22 leaf -- normally for those needles to be shed and the
23 new needles to grow.

24 THE CHAIRMAN: That's a good answer, it
25 actually makes sense.

1 MS. KRISHKA: Thank you.

2 MR. HYNARD: I can think of other cases
3 too, Mr. Chairman, where you get a negative response to
4 a tending treatment and I am thinking of red pine
5 plantations in which the thinning is delayed to the
6 point where the trees have very small crowns and very
7 long spinly stems, and a thinning conducted too late
8 will result in stem damage through ice and wind to the
9 residual stand. So that you can get tremendous losses
10 following a tending treatment that is too heavy too
11 late.

12 THE CHAIRMAN: Thank you.

13 MS. MURPHY: Q. Is there a difference as
14 the trees get older with the amount of volume that they
15 will be putting on in any year in the normal course?
16 Do they start to decline at some stage?

17 MR. HYNARD: A. The volume added per
18 tree?

19 Q. Mm-hmm.

20 A. Well, yes, yes, that's certainly
21 true.

22 Q. So one would have to know what the
23 normal rate was for these trees in the untended area as
24 well if one were to determine whether that decline was
25 happening in the untended area as well as in the

1 treated area?

2 A. Yes, that's why Ms. Krishka mentioned
3 the need for control areas.

4 MS. KRISHKA: A. I would like you to
5 take a look at a study at the very bottom of the page
6 that was reported by Wilcox, 1979. That was the same
7 stand that I understand the Board viewed on your recent
8 site visit near the Bonner Seed Tree Centre, or Tree
9 Improvement Centre, I am sorry.

10 This study was done 10 years ago. It
11 recorded the volume growth on those stands at that
12 time, 28 years -- when the stand was 28 years old. At
13 that time the volume per hectare was almost 150 per
14 cent greater on the treated area than on the untreated
15 area.

16 What I would like you to do is just, you
17 know, run your eye down that second column to the left
18 and what I hope you will observe is that generally you
19 can say that there are significant increases in volume
20 per hectare in these studies and what they show us is a
21 general trend.

22 Although the studies may not be directly
23 comparable, they do show a trend and give us some
24 direction as to what we can expect as a result of
25 cleaning treatments. And again I will remind you that

1 these studies were both chemical and manual cleaning.

2 One last point. It might be interesting
3 to note that that particular study that was done in
4 the -- near the Bonner Tree Improvement Centre that you
5 observed was a result of -- the treatment had been
6 manually cleaned at least four times.

7 So if you look at these manual treated
8 areas and you see quite good responses or quite good
9 benefits in volume as a result of manual cleaning and
10 you look at the chemical ones and say: Well, those
11 aren't too bad either, what is the difference? The
12 difference, in some cases, are the multiple treatments
13 that were done in the manual treated areas.

14 You will recall that I had said that
15 there was a category that was classified as nil or
16 negative and I expect that people would be interested
17 to know why some of the studies reported nil or
18 negative results. So I would like to explain that just
19 briefly.

20 When you look at scientific literature
21 you have to understand the reason for doing the study
22 or specifically: What was the study objectives.

23 Can I have the next overhead?

24 There are some study objectives that are
25 specific to herbicides, and Dr. Campbell has alluded to

1 this in his discussion. There are two common
2 objectives to herbicide studies; one being to identify
3 what the optimum application rates are; and, secondly,
4 to identify what the optimum timing for application is.

5 Now, if you recall, I had said earlier
6 that there are a couple of ways of measuring
7 effectiveness, there is efficacy and there is
8 effectiveness. These studies look at efficacy
9 specifically. What they are looking at is they are
10 measuring the direct rather than the indirect effects.

11 The purpose of rate studies are to
12 determine tolerance limits for crop trees and to
13 determine maximum efficacy levels for competition
14 control. The objective is to determine optimum
15 operational application rates.

16 The purpose of timing studies are to
17 determine optimum spray windows - I believe Dr.
18 Campbell used that term earlier - and in reply to Mr.
19 Martel's question what he said -- or I will explain
20 what I am talking about just to clarify it.

21 In this case we are talking about
22 spraying window, the timing in which you can spray
23 where you will not damage your crop tree; that is, the
24 crop tree has stopped growing at that point, but your
25 competing vegetation is still actively growing,

1 therefore, you can control it.

2 The objective again here is to determine
3 what the optimum operational spray windows are; that
4 is, the optimum timing of application. In both cases,
5 what you are doing is testing limits and negative
6 results usually occur when you are trying to test your
7 limits.

8 Most of the studies in this literature
9 review which reported nil or negative results were
10 studies of this nature; that is, they were either rate
11 or timing studies.

12 The reason that these studies are useful
13 for managers is that when you are undertaking
14 operations, you are concerned mostly about four things:

15 First of all, you want to use the minimum
16 amount of herbicide necessary and that would be for
17 economic reasons, operational reasons, environmental
18 reasons; that is, you do not want to use any more than
19 necessary.

20 Secondly, you want to maximize efficacy,
21 so that you can meet your management objectives.

22 Thirdly, you want to minimize crop
23 damage, you don't want to harm the trees that you were
24 trying to tend.

25 And, finally, you want to select rates

1 and timing within the labeled parameters because you
2 know that you must work within the legal registered
3 label rates and timing.

4 So that is the main reason for doing
5 these types of rates and timing studies. Essentially,
6 what you can achieve by doing them is, timing and rate
7 studies will help to refine and optimize herbicide
8 application under certain growing conditions.

9 Those particular studies I have just
10 described looked at efficacy. There are other studies
11 that have specifically looked at effectiveness; that
12 is, the indirect effects. There are other important
13 factors that you have to consider when you are looking
14 at effectiveness studies.

15 Could I have the next overhead?

16 There are a number of factors affecting
17 study results. One thing you have to consider when you
18 are looking at a study is what was the term or duration
19 of the study; that is, how long did they continue the
20 study for.

21 Secondly, you want to know whether the
22 time of the post-treatment assessment; that is, when
23 did the assessment begin subsequent to the cleaning
24 treatment.

25 Thirdly, you want to know about competing

1 species and their recovery time; you want to identify
2 what species is present and how long did it take for
3 the species to regrow or return to the site. This will
4 vary. For example, grass and aspen return quickly to a
5 site usually depending on the treatment. Other species
6 will return but perhaps at a slower rate.

7 The fourth item you would want to
8 consider is conifer cross-species and response time.
9 Again, you want to identify what your species is and
10 how long did it take for the species to respond to the
11 release treatment. This will vary also within species
12 or between species. Jack pine and black spruce usually
13 respond fairly quickly to a release treatment and, as
14 we previously discussed, white spruce often respond
15 slower.

16 There is a particular study that is
17 reported in my statement of evidence by Richardson in
18 1979. He went into a jack pine and black spruce
19 plantation two years after a cleaning treatment and he
20 saw no difference between the treated and the control
21 area. He went back two years later, which was four
22 years after the treatment, and he recorded significant
23 increases in height growth in the treated area.

24 A fifth factor is the parameters used to
25 measure effect and we have already gone through the

1 list of parameters.

2 And finally you would want to consider
3 the number of treatments. And again I explained why,
4 particularly when considering manual treatments, and
5 note the Bonner Tree Improvement Centre Site.

6 For herbicide treatments there is a
7 couple of other things you should also consider. You
8 want to consider what the mode of action of the
9 herbicide was; that is, is it foliar or is it soil
10 active, and Dr. Campbell has described that. And,
11 finally, what herbicide application rates and timing
12 were.

13 The point is that you cannot assess a
14 study or take two and compare them without examining
15 and knowing what these factors were and accounting for
16 them. Knowing these factors you can compare some
17 studies and you can generally observe trends. Because
18 the factors are complex and the time of rotation is
19 very long, we interpret fairly conservatively, and I
20 would ask you to just take another look at this table
21 that we had.

22 You will note that there is a study that
23 reports an increase in volume per hectare to be over
24 630 per cent. Well, if we took that and we
25 extrapolated and said: Well, okay, it put on 630 per

1 cent volume in this amount of time, it's just going to
2 keep growing at that rate. Well, when it comes to
3 rotation, there is going to be a pretty happy forester
4 somewhere.

5 We are pretty certain that that is not
6 the case. In fact Peter Hynard just explained that we
7 know that volume rate does drop off at a certain point
8 in time, so we do tend to interpret these results
9 conservatively knowing that we are not expecting these
10 growth rates to continue at the same rate.

11 So these types of studies, although you
12 may not be able to compare study A directly with --
13 study B and take the results from study A and apply
14 them everywhere, they do give you a general direction
15 of where things are headed.

16 We were able to draw certain conclusions
17 from the studies that we reviewed. I don't intend to
18 go through or lead you through the 116 studies that we
19 looked at, they are all listed in my statement of
20 evidence, and I went into a little bit of detail of a
21 certain number of them. Instead, I will just simply
22 describe the basic conclusions that we have drawn from
23 this literature review.

24 Next overhead?

25 Our first conclusion was that short-term

1 results of cleaning are documented and positive and you
2 have seen a small sample of that in the table I showed
3 you and we observed the same trends in the remaining
4 studies.

5 Secondly, we concluded that long-term
6 benefits are expected as a result of increased early
7 survival. And early gains in stem and stand volume are
8 expected to be realized at time of harvest.

9 There was an issue that was raised by
10 Ministry of Environment as to whether our database was
11 adequate to determine effectiveness of silvicultural
12 investments in regeneration. It is my view that the
13 studies that we reviewed here gave a pretty strong
14 indication that in fact there is a benefit and that the
15 database that we have is adequate. It may not be as
16 good as it could be, but it certainly is fairly
17 conclusive.

18 I had stated the third conclusion is
19 early gains in stem and stand volume are expected to be
20 realized at time of harvest, that would be through
21 reduced rotation and/or increased yield. We think that
22 it's kind of logical to assume increased yield if, for
23 nothing else, but through increased survival.

24 So I told yield would be volume per
25 hectare and that would be a function of both the

1 increase of volume per stem and the number of stems in
2 the area. However, the short-term results cannot be
3 directly extrapolated to long-term results because the
4 relationships may not be linear.

5 The problem is that there is a lack of
6 scientific certainty re quantification of long-term
7 conifer benefit. Qualitatively we can be fairly
8 confident of the benefit under certain conditions, but
9 we are not able to quantify it and that is because the
10 data -- the data is lacking because there are few
11 tended plantations, if any, that have reached an end of
12 rotation at this time.

13 I would like to just show you a few
14 slides to show you the kind of results that I have
15 observed and --

16 MS. MURPHY: And I would suggest at this
17 point that Ms. Krishka take the last few minutes to
18 show us a few, it's four I believe, slides that
19 describe some of the results on these studies and then
20 I think that would be a good time to retire for the
21 day.

22 THE CHAIRMAN: Very well.

23 MS. KRISHKA: There were some questions
24 about what data was available in Ontario with regards
25 to conifer response. There are a number of studies in

1 Ontario and I will show you two of them that I was
2 involved with. This is on page 9 of one of the reports
3 I believe. Exhibit 628.

4 MS. MURPHY: Q. I believe -- all right.
5 This is the report that deals with Manitouwadge?

6 MS. KRISHKA: A. That's right.

7 Q. And it's in Exhibit 628 and the
8 diagram that you are showing us now is on page 9?

9 A. That's right. This was a study that
10 was conducted in Manitouwadage, Ontario in Terrace bay
11 District. We looked at three different plantations,
12 two white spruce plantations and one black spruce
13 plantation and we assessed each one three years after a
14 tending -- a cleaning treatment using 2,4-D.

15 This particular table shows relative
16 dominance of spruce crop trees under control in 2,4-D
17 treated conditions two years after tending.

18 If you look at the three columns down the
19 left side of each graph they represent trees growing
20 under controlled conditions.

21 Q. That is in the controll area?

22 A. I am sorry, in the control area. The
23 three bars down each side represent trees growing in
24 the control area; the three bars on the right side
25 represent trees growing in the treatment area.

1 Trees that are growing in these clear
2 bars are suppressed; in the cross-hatched bars are
3 intermediate growing and, in the clear bars, they are
4 open growing.

5 If you observe the far right of each box
6 you will see a very tall clear box which represents
7 trees growing under open grown conditions. The vast
8 majority of trees in each plantation in the treated
9 areas were all growing under open grown conditions.

10 Q. Now, when you discuss the different
11 parameters that are used in these studies, one of them
12 you described was dominance or crown position. Is that
13 what this particular part of your study is about?

14 A. Yes, it is. In the control area, you
15 look and you can see that most of the trees in the
16 control areas in all three plantations were growing in
17 suppressed and intermediate suppressed conditions.
18 This next graph is in the same study area.

19 Q. What page is that one?

20 A. This is on page 16.

21 THE CHAIRMAN: Just going back to the
22 last one. I take it that the two boxes on the right,
23 suppressed and intermediate where, as the result of the
24 treatment, they virtually disappear; is that what that
25 shows?

1 MS. KRISHKA: Yes. Basically what it
2 shows is that three years after the treatment the crop
3 trees are grown under open grown conditions, they are
4 not being overtopped by competing vegetation.

5 MS. MURPHY: Q. And the number of trees
6 that are being assessed in the control area and in the
7 treatment area, is it possible to tell that from this
8 diagram?

9 MS. KRISHKA: A. Oh yes. The value --
10 the number values that are written there is the size of
11 the sample, the total number of trees that were
12 measured in that area.

13 So in that particular case I believe it
14 says N equals 129, means 129 trees -- total number of
15 trees were measured in the treatment area.

16 Q. So then just to make it clear, the
17 idea is that looking at the top one, just as an
18 example, on the left-hand side we see three boxes and
19 it is showing us that of 115 tree assessed, the
20 substantial majority of them were either...

21 A. In the control area?

22 Q. Yes.

23 A. They were either suppressed; that is,
24 in the white box and it's about 55 per cent of the
25 trees were growing under suppressed conditions.

1 THE CHAIRMAN: And these were all the
2 crop trees; right?

3 MS. KRISHKA: Yes, these are all crop
4 trees. In that particular case it's black spruce. 30
5 per cent of the trees in the control area were growing
6 under intermediate suppression, and only about 10 per
7 cent of the trees were growing in open grown condition.

8 MS. MURPHY: As compared to the other
9 side of the graph.

10 THE CHAIRMAN: And then you tended them.
11 You are looking at the same trees--

12 MS. KRISHKA: Exactly.

13 THE CHAIRMAN: --and saying that very few
14 of them are suppressed or intermediate, most of them
15 are open of the same 129 trees -- roughly the same
16 number of trees. Is that what you are saying?

17 MS. KRISHKA: That's correct. The
18 control area was established within the same plantation
19 in the same area and other than the fact that the
20 control area was not treated, everything else was the
21 same. Again, we are in the same study area, the same
22 plots.

23 MS. MURPHY: Just a second, before you go
24 on.

25 THE CHAIRMAN: I don't know if we are

1 confused, but they are not the same trees because on
2 one side you are looking at the controlled trees and on
3 the other side you are looking at the treated.

4 MS. KRISHKA: It's a different
5 population. In the control area in this plantation we
6 measured 115 trees in those plots; in another area that
7 was treated, we measured other trees. In that case the
8 sample was 129 trees.

9 THE CHAIRMAN: Different trees?

10 MS. KRISHKA: Different trees.

11 THE CHAIRMAN: Okay, got it.

12 MS. KRISHKA: Sorry, if I wasn't clear.

13 THE CHAIRMAN: No, no, we get unclear
14 probably at this time of day.

15 MR. MARTEL: And the growth rate was --
16 are you measuring that at all; no?

17 MS. MURPHY: That's in another one of the
18 tables in the same study that we will be looking at in
19 one minute.

20 The parameter that is being measured in
21 this particular set of data is the relative dominance
22 and I believe Ms. Krishka is going to show you the
23 results of data measuring two other parameters in the
24 same study.

25 Q. Just one other question about this

1 particular graph. If an assessment had been made of
2 the areas that are now in the treatment area -- if an
3 assessment had been made of that area and the control
4 area prior to treatment, would they have been -- would
5 the trees in those areas have been in similar
6 conditions?

7 MS. KRISHKA: A. I would say that, yes,
8 you would have to assume that. Although we didn't go
9 in and establish these plots prior to the control
10 treatment, given the fact that the control was
11 established under similar conditions in the same
12 plantation, we would assume that, yes, they were
13 growing under basically the same dominance condition.

14 We also can I think safely assume that
15 the treated trees prior to treatment were suppressed
16 otherwise they would not have been treated.

17 MS. MURPHY: Mr. Chairman, may I make a
18 suggestion?

19 THE CHAIRMAN: Yes.

20 MS. MURPHY: It is a little late in the
21 day and it is a little hard slogging through this kind
22 of thing at this time of day. It might also be easier
23 for people to follow it if they have had an opportunity
24 to look at these things over the evening.

25 THE CHAIRMAN: Okay.

1 MS. MURPHY: I might suggest that there
2 is one other page -- one other graph that you might
3 want to look at before tomorrow and it's on page...

4 MS. KRISHKA: Page 13.

5 MS. MURPHY: Page 13. So in this
6 particular study, this Exhibit 628, Ms. Krishka will be
7 looking at graphs on page 9, 13, and...?

8 MS. KRISHKA: 16.

9 MS. MURPHY: 16. And in the other study,
10 Exhibit 629, she will be asking you to look at graphs
11 that are on page 10. It might be easier to follow if
12 we look at them over the evening and start that in the
13 morning.

14 THE CHAIRMAN: It's almost as much fun as
15 Dr. Osborn's stuff.

16 MS. MURPHY: We will have to bring in
17 some demonstrative evidence.

18 THE CHAIRMAN: Okay. Thank you. We will
19 adjourn until nine o'clock tomorrow morning.

20 ---Whereupon the hearing adjourned at 5:30 p.m., to be
21 reconvened on Wednesday, June, 7th, 1989, commencing
at 9:00 a.m.

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